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Preface to Volume XXVII

Unification of good will

Good will which is not free is of little worth, and the chances are that it is not good at all, for whenever the will of a people has been unified by coercion this has always involved endless miseries in the form of hatred, cruelty, treachery, abject fear and more often than not, depravity. Will unified at such a price is evil, not good. However advantageous it may prove to be momentarily to a definite group, it cannot be to advantage of mankind as a whole.

Centuries ago most theologians were still blind enough to believe that people could be saved, as it were in spite of themselves, by forcible conversion. The fruit of such perverse beliefs was a long series of persecutions and wars, during which people killed, maimed and tortured one another in the name of religious ideals, in the name of Charity and Mercy. It is now generally admitted that no faith can be of any good to any individual unless he has freely assented to it. This does not imply any latitudinarianism, it does not imply that theologians and priests have lost their conviction of the superiority of their own religion or that in their eyes all religions have become alike; it simply means what it says, that religion has no value unless it be the individual's own, discovered or continued in freedom, without bribes or fears. (1)

It is strange that at the very time when the leading Churches have finally attained such wisdom, States should revive the wickedness and stupidity of intolerance. What the latter succeed in building up by such violent and execrable means is exceedingly fragile, for the equality of action and reaction obtains in the social world as well as in the material one. Atrocities and crimes may be hidden for a time, they may be apparently condoned by the innocent

(1) This separates religion from superstition or magic. In the case of magic the recipes, the rites are everything; in the case of religion, moral conviction is supreme and the rites symbolical and accessory.

witness who chances to know of them, nevertheless they cry for vengeance, and vengeance will come in the fullness of time. What is built up by sheer brutality will probably be destroyed in the same manner. At any rate we are not concerned at present with the unification of the people's will which is thus achieved, or seems to be achieved. It should be noted in passing that the measurement of such unification is practically impossible, for as soon as the opposition to a dictator is too dangerous, it becomes secret, and the secrecy may have to be carried so far that each man conceals his resentment within his own heart. For the same reason there are no means of uniting the men who would withstand a merciless tyrant, nor is it possible for them to measure their own strength. When freedom of opinion is cancelled it is impossible to know the real opinions of the people, and however clear the statements of a dictator and his junta may be, they do not represent anything but their own fancies. When all opposition is quenched or forced underground, when every form of criticism is discouraged, the situation seems very clear indeed (one hears only a single voice), but in reality it is extremely obscure.

***

To return to our subject, how can the good will of people be unified without physical or moral constraint, without unfair proselytism or indiscreet propaganda? That is the crucial problem of our time, and indeed of every time. How can one harmonize freedom with unity? How can good will be sufficiently convergent to resist the pressure of unified bad will? How can individual love disarm regimented hatred?

It is not enough to argue [as I have done before (2)], that good will is unified in fact, because the people who try to increase our treasures of charity, beauty, justice and truth are all of them, whether they be aware of it or not, struggling in the same direction. Matters would be a great deal easier and life more pleasant, if the good willed people could be persuaded to pull together at the same time. To win in the long run is good, but it is better still not to be beaten separately in the meanwhile.

***

(2) *The history of science and the problems of to-day* (Washington, 1936).

The only method that I can think of is to search for the truth and to publish it. This may seem a very simple statement but it is in reality very comprehensive, for the search for the truth implies the whole of science and learning, and the publication of it implies the whole of education in all its forms.

The evil which would flourish in the darkness is likely to be killed in the light. This is not as generally realized as it should be, because it is quite true that scientific investigations have been restricted in order to avoid unwelcome implications. It has frequently been hinted by our brethren of the Russian persuasion that such restrictions were not by any means accidental, scientific activities being supported directly or indirectly by people who preferred to keep the searchlights out of their own private fields. How true that is it would be difficult to estimate and this is not the place or the time to attempt it. It is quite certain that many evils have flourished down to our own days and in the most civilized countries because of the secrecy or darkness which was allowed to surround them. Destroy that darkness, replace it with abundant light, and I do not say that the evils will be immediately destroyed, but at any rate it will become possible to bring about their destruction. Social evils are not very different in that respect from individual diseases. As long as the disease is unrecognized it can hardly be fought. When it is finally identified, investigations are eagerly pursued until the cause is discovered and therapeutical means can be developed against it.

Social evils have often been veiled, consciously or unconsciously,by the people who benefited from them or imagined that they were benefiting. Such evils should be torn to pieces. It is exceedingly foolish to think that a bad situation does not obtain, because one is forbidden to look into it. For one thing the story can never be completely hushed, for it cannot be hidden from its very victims who are of two kinds, the men of prey and those preyed upon. It is difficult to say which of those two groups of victims are the most abject and the most pitiable.

The evil festering in secrecy is the worst kind of evil. Open up the wound, throw the light of truth into it, and you will begin its healing. This is not sufficiently understood, and many people object to truth, — not only the miserable ones who thrive on the darkness. Indeed the first result of light-throwing is to reveal

the evil to many who did not know of it, and as it were to create it for them. Yet nothing is more certain than that it cannot be fought and ultimately extirpated without being exposed to the full light and revealed in all its horror. Nobody enjoys the revelation of sins, evils, atrocities, anymore than he would enjoy the revelation of ugly wounds and ulcers, but that is in every case the necessary condition of recovery.

***

One of the paradoxes of life, and perhaps the most tragic, is the fact that human culture is always precarious and that its fragility tends to increase with its very refinement. The purer it is and the more vulnerable it becomes. Now there will always remain in every human group and every class of society, a dangerous number of brutes who may jeopardize at any time the innocent happiness and the peace of their fellowmen. The depredations of those brutes are generally restricted by their lack of intelligence and opportunity, but sometimes — if they manage to obtain a stranglehold on the whole community — their power for evil can only be abridged by new accidents, the mercifulness of natural death or the heroism of tyrannicides. The most melancholy circumstance is that human brutes derive their strength mainly from the weakness of other men; indeed, there seems to be always a sufficient number of people, not only bad ones but good ones as well, who are ready enough to submit to tyranny and to adore it. Hence relapses into barbarism — whether ordered or chaotic — may occur (they have occurred) in the midst of civilization.

***

What can we do to save ourselves from such dangers? The best remedy is to fight for the truth and for freedom of thought; that is, the freedom to search for the truth and to publish whatever we may find of it without fear or prejudice. The men who try to suppress that freedom may have their own way for a while, but they will be ultimately defeated (they have always been defeated in the past) for as LINCOLN put it one cannot fool all the people all the time.

The fight for the truth and for intellectual freedom is difficult, precarious, endless; yet it must be faced — day after day, year after year, generation after generation — that is, if we wish to reach not that passive kind of happiness meet only for brutes and dumb beasts, but the enlightened happiness which alone can justify mankind. Indeed culture, even as good will and happiness, can only be shared by each individual if his enjoyment of it is genuine and free, if he has been able to rediscover it and to create it anew. The search for the truth, its publication and defense, constitute the ultimate guarantees of culture. They provide a way to its preservation and purification and enrichment; it is a very slow way, but all considered, the only one.

GEORGE SARTON

R.M.S. Lady Drake.
Gulf of Paria, off Port of Spain,
December 22, 1936.

Sur les dates de la vie du mathématicien arabe marocain Ibn al-Bannā' (XII^{e}-XIII^{e} s. J.C.)

M. STEINSCHNEIDER a consacré jadis à IBN AL-BANNĀ (Cf. SARTON, *Introd.*, II, 998) une courte étude qu'il a intitulée *Rectification de quelques erreurs*. Elle aurait besoin d'être reprise, car d'autres erreurs se perpétuent et je retrouve encore dans le travail récent d'A. G. KAPP sur les traducteurs et commentateurs d'EUCLIDE (*Isis* n° 63, p. 157) la date erronée de ca. 740 (1340 J.C). comme celle de la mort d'IBN AL-BANNĀ à Marrākush.

La faute en est à SUTER (*Math. u. Astron. d'Arab.*, n° 399) ou plutôt à une lecture incomplète de SUTER. Comment, en effet, l'historien scrupuleux qu'il était s'est-il écarté dans une telle proportion des dates données par le biographe AḤMAD BĀBĀ AL-SŪDĀNĪ et le mathématicien AL-QALAṢĀDĪ, dates qui varient seulement de 721 à 724 Hég., 1321-1323 J.C.? Il s'en explique dans ses *Anmerkungen*, p. 220, note 81, en invoquant l'autorité d'IBN KHALDŪN, presque contemporain d'IBN AL-BANNĀ, tandis que les auteurs précités ont vécu un siècle et demi et deux siècles plus tard. Or IBN KHALDŪN aurait placé le décès du mathématicien marocain peu avant 740. Mais SUTER fait une réserve :

> Es könnte ja allerdings möglich sein, dass IBN CHALDŪN die Lebensdaten seines Lehrers EL-ABBELI (s. Art. 414) nicht in der richtigen Reihenfolge aufgezählt hätte, so dass dieser den IBN EL-BENNĀ *vor* seiner Wallfart nach Mekka, die 735 stattfand, in Marokko gehört haben konnte.

En somme, tout tourne autour de la date du pèlerinage d'AL-ABBALĪ (ou, pour d'autres : ABULĪ) qui, d'après IBN KHALDŪN, se serait rendu au Maroc après son retour de la Mekke, pour suivre l'enseignement d'IBN AL-BANNĀ. Autrement dit : ou bien la date du pèlerinage (735) n'est pas exacte, ou bien, hypothèse de SUTER, le voyage d'AL-ABULĪ au Maroc doit être avancé.

Je me suis donc reporté à l'autobiographie d'IBN-KHALDŪN placée en-tête de la traduction française des *Prolégomènes* par DE SLANE, dont l'interprétation a toujours passé pour excellente, et voici ce que j'ai découvert. IBN KHALDŪN, retraçant (p. XXIV-XXVI) la vie de son maître AL-ABULĪ, ne cite aucunement la date de 735; il se borne à dire que « lors du grand siège de Tlemcen, il quitta cette ville et fit le pèlerinage de la Mecque ». Revenu dans son pays, il reprit ses études. Quelque temps après, il passa au Maghrib, ayant du s'enfuir de Tlemcen « parce qu'ABOU HAMMOU MOUÇA IBN YAGHMORACEN, souverain de cette ville, avait voulu le contraindre à prendre la direction générale des finances et le contrôle des revenus fournis par les impôts. Arrivé à Maroc (Marrakech), il suivit avec assiduité les leçons du célèbre ABOU'L-ABBAS IBN EL-BENNA... »

Quelle est donc l'origine de l'erreur? Elle réside dans la note 4 mise par DE SLANE au bas de la p. XXIV :

> En l'an 735 (1334-1335 de J.C.) ABOU'L-HACEN, le sultan mérinide mit le siège devant Tlemcen. Le 27 ramadan 737 (1er mai 1337), il s'en empara de vive force (*Hist. des Berbères*, t. III, p. 410 et t. IV, p. 221).

C'est exact, mais le « grand siège » de Tlemcen n'est pas celui là; c'est l'investissement, plus long encore et infructueux, que subit cette ville de 698 à 706-1299 à 1307, par les troupes du sultan marocain YŪSUF B.YA'QŪB AN-NĀṢIR, et durant lequel fut bâti le fameux camp — devenu ville de Manṣūra. Or, à quelle époque régna à Tlemcen ABŪ ḤAMMŪ MŪSĀ, dont les exigences furent cause de la fuite d'AL-ABULĪ? A partir du dernier trimestre de 707/avril 1308, et jusqu'en 718-1318. Nous voici ramenés, si j'ose dire, « dans les limites de l'épure ».

D'ailleurs la question est résolue si l'on se reporte à la notice que consacre à AL-ABULĪ, l'historien des hommes illustres de Tlemcen, IBN MARIAM (XVIe s.), dans son *Bustān* (Édit. BEN CHENEB, Alger 1326-1908, p. 214, et trad. PROVENZALI, dº, 1910, p. 247). Après avoir cité le texte d'IBN KHALDŪN et donné la parole à AL-ABULĪ lui-même, pour le récit de son pèlerinage et des circonstances qui l'amenèrent à s'enfuir à Fès, IBN MARIAM poursuit : « De là il se rendit dans la ville de Marrakech vers l'an 710 (incip. 31 Mai 1310) et s'installa chez l'imām IBN AL-BANNĀ... »

Il n'existe donc aucune raison pour reporter entre 735 et 740

la mort du mathématicien marocain. Tout porte à croire que la date donnée par AL-QALAṢĀDĪ, IBN AL-QĀḌĪ (d'où M. SANCHEZ PEREZ a tiré sa notice sur IBN AL-BANNĀ, p. 51, nº 44 de ses *Biografias de Matematicos Arabes*), et d'autres : 5 ou 6 Rajāb 721-31 juillet ou 1e août 1321, est exacte. Il avait, dit IBN QUNFUDH (Ms. 423 Inv. de Rabat, F. 4*a*), 64 ans et 6 mois, ce qui le fait naître au début de 657 Hégire — fin de 1258 J.C. AḤMAD BĀBĀ et IBN AL-QĀḌĪ donnent : fin de 654; il ne faut d'ailleurs pas être trop exigeant pour les dates de naissance et s'attacher surtout, pour la chronologie, à celle des décès.

Ainsi se trouve résolu un petit problème, qui, pour n'avoir pas eu l'importance de celui que posait naguère la date de la mort du grand savant arabo-persan AL-RĀZĪ (cf. *Isis* V, 26 sq.), emprunte son intérêt à la notoriété que conserve encore IBN AL-BANNĀ dans les pays occidentaux.

Institut des Hautes Études marocaines. Rabat. H. P. J. RENAUD

An unnoticed treatise of Roger Bacon on time and motion

A great deal of serious work has been done during the last decades on the life and literary activity of ROGER BACON (1214-1294?). Yet the task of properly estimating BACON's work remains immensely complicated by the difficulties arising out of faulty MS transmission, BACON's frequent reworking of parts of his larger works, the fact that he left a number of fragments and unfinished works and the regrettable fact that the number of works unascribed in MS which are probably genuine is doubtless greater in his case than for any comparable figure of his century.(1) The reason for this is not far to seek: he was in trouble with his superiors during much of his productive life and it was not fashionable to quote him as an authority either during his lifetime or during the century after his death. In view of these circumstances it is, to say the least, fortunate that we have, authenticated, as much of his work as we do. The general lack of MS ascription in BACON codices has not made the work of Mr. STEELE and his collaborators easier.(2) When, therefore, a hitherto unnoticed work of BACON appears in a XIIIth century MS written by an English scribe, there is cause for satisfaction. The opusculum here presented may serve to authenticate some other work now attributed to BACON on less solid grounds, or fill in a gap in the general picture of his thought.

MS 3314 of the Biblioteca Nacional in Madrid is a quarto miscellaneous codex containing a number of psychological and philosophical treatises of the mid-XIIIth century. On ff. 1-67

(1) See A. G. LITTLE, in *Roger Bacon Essays* (Oxford, 1914), pp. 375-419, for an extensive list of MSS and works. For a more recent list, see P. GLORIEUX, *Répertoire des maîtres en théologie de Paris au XIIIe siècle, II* (Paris, 1934), pp. 60-76.

(2) R. STEELE, F. DELORME, A. G. LITTLE, E. WITHINGTON, *Opera hactenus inedita Rogeri Bacon*, (Oxford, 1905 et seqq.) 13 fascicles.

is found (3) the very important psychological treatise *De Anima* of PETRUS HISPANUS PORTUGALENSIS, later Pope John XXI. In this codex the work was written by a north French, perhaps Parisian, scribe in the second half of the XIIIth century. The rest of the codex is by another scribe, and it is evident from the fact that f. 68A begins in the middle of a commentary on ARISTOTLE'S *De Anima*, that two separate MSS have been bound together. This second MS, i.e., the remainder of the codex, ff. 68A-117B, is written in a small, neat, English bookhand which, by its roundness and the shading of the letters, shows that the scribe was strongly influenced by, if not trained in, the chancery hand of the middle of the XIIIth century. The hand should be dated not later than *ca.* 1275, a date which would also fit occasional chartish marginalia throughout this part of the codex. From f. 89A to 92D there are six minor works of GROSSETESTE, the *De Calore Solis*, *De Cometis*, in the longer and original recension, *De Iride*, *De Colore* and two opuscula, *De Calore Questio* and *De Operacionibus Solis*, hitherto unknown, which I am publishing elsewhere. The last of the GROSSETESTE opuscula ends near the top of f. 92D. After a blank space of about one line, there begins another work with this incipit: *Si terminus ad quem generandus sit res permanens...* In the right margin, probably in the original hand, we find D. (ominus) BACUN. Careful reading of the text will show that, from the point of view of style, manner of argument and general *ductus*, there can be no doubt that the ascription, ordinarily, because written before the death of the author, completely acceptable as determinative by itself, is authentic. Several verbal parallels with sections of the *Communia Naturalia* are noticed in the footnotes. More could easily be adduced.

It is not clear just whether the work was intended to be an independent *determinacio*, or is a part of a commentary on the Physics extracted and reworked. It does not, in its present form, bear the marks of commentarial technique. BACON wrote *Questiones in Physica I-VI*, but our opusculum is not a *questio*. We may hope for eventual solution of the question as to the intention

(3) See M. GRABMANN, Ein ungedrucktes Lehrbuch d. Psychologie d. PETRUS HISPANUS, in *Spanische Forschungen d. Görresgesellschaft*, I (Münster i. W., 1928), 106-173, and his *Mittelalterliches Geistesleben* II (Munich, 1936), 126-7.

of BACON in writing the work and the date of its composition, but at present we can only offer the text as it stands, ascribed and so far as we know at the present time unique.

Madrid, B. N. MS 3314, f. 92 D

Si terminus ad quem generandus sit res permanens tunc intelligenda est transmutacio naturalis fieri ut dicetur. Oportet autem ponere quod aliquod est tempus in futura quod compleatur tota transmutacio et extra quod non fiat aliquid illius transmutacionis, quia omnis transmutacio coequatur alicui mensure duranti sibi proporcionali. Oportet eciam ponere quod istud tempus sit finitum quia transmutacio est finita eo quod aliquando completur tota, et terminus ad quem complete adquiratur. Finis vero temporis non est nisi instans. Ergo contingit dicere quod duo quodammodo erunt hic, tempus videlicet et instans finis eius. Et tamen non omnino ponunt in numerum, quia instans complet substanciam temporis et cadit in eius diffinicione sicut punctus in diffinicione linee, si enim non esset punctus non esset linea (4), et si non esset instans impossibile est tempus esse, quia non potest intelligi linea infinita, ut dicitur 1° *Metaphisice* (5), neque potest esse et ideo neque tempus infinitum. Unde cum dico tempus infinitum includo opposita. Infinitas enim excludit tempus, quia impossibile est ponere infinitatem actualem nisi in causa prima cuius essencia est alia a tempore et linea propter quod Aristoteles vult in 1° *Celi et Mundi* quod ille qui ponit mundum infinitum errat in principio mundi scilicet in causa prima, secundum quod exponit Commentator dicens : qui ponit mundum esse infinitum non videt ipsum habere principium neque eternum neque non eternum et ideo non potest aliud esse infinitum quam causa prima. Propter hoc ergo finitas (*sequitur ee*) est essencialis et substancialis tempori et per consequens finis eius cuius est instans. Ideoque cum dico tempus, includitur instans. Et hoc dico propter hoc quod cum dictum est quod oportet ponere tempus aliquod infinitum quod compleatur transmutacio quod instans intelligatur substancialiter in isto tempore et per nomen eius. Oportet eciam ponere quod tempus a parte una non potest habere duo instancia, sicut nec una linea potest habere duo puncta a parte una.

Mensura ergo tocius transmutacionis ab igne in aquam erit unum tempus finitum cuius finis est unum instans ita quod tota transmutacio compleatur in (a)

a) in *add. in marg. manu prima.*

isto tempore sic finito ut nichil ipsius transmutacionis ultra finem istius temporis inveniatur et ut in tempore illo finito adquiratur totus terminus ad quem, et corrumpatur totus terminus a quo. Cum ergo hic sic se habeat totum tempus istud vocetur *a* et instans quod est terminus vocetur *c*. Ulterius ergo sciendum est quod his est duplex transmutacio : una est corrupcio termini a quo, ut ignis, et generacio termini ad quem, ut aque. Quatinus autem planius capiatur veritas loquamur primo de una illarum et postea de alia. Corrupcio autem tota complebitur in toto *a* finito per *c*, sed sicut contingit reperire in tempore aliquid divisibile ut fluxus temporis et aliquid indivisibile ut instans terminus eius sic oportet ponere a parte transmutacionis. Ergo in illa aliquid erit divisibile quod mensuratur

(4) See R. BACON, *Communia Naturalia*, ed. STEELE (Oxford, 1911), p. 172 : *Sed instans non est pars temporis...* etc.

(5) *Meta.* 992ª, 22.

tempore et aliquid indivisibile quod mensuratur instanti. Illud indivisibile erit terminus divisibilis in transmutacione sicut instans in tempore. Ipsum vero divisibile dicitur motus, quia tempus non est mensura per se nisi motus et quietis per accidens. Sed ista transmutacio que est corrupcio ignis non est quies propter quod erit motus, nec obstat quod dicitur in quinto *Phisicorum* quod tantum sunt tres species motus; loci mutacio in ubi, alteracio in qualitate et augmentum et diminucio in quantitate. Et ideo generacio et corrupcio non erunt motus secundum hoc precipue cum Aristoteles dicat in illo quinto quod motus non est (f. 93^A_) in substanciam sed mutatio que dicitur ab eo generacio vel corrupcio. Ad hoc autem dici potest quod motus uno modo sumitur largius, scilicet pro omni transmutacione successiva, et sic cadit in diffinicione temporis cum dicitur quod tempus est numerus motus secundum prius et posterius et sic generacio et corrupcio sunt motus secundum quod dicit in *Predicamentis* (6) et tercio *Phisicorum* (7), et alibi sepe utitur nomine motus pro illis. Aliter sumitur motus striccius pro sola transmutacione successiva que fit a subiecto in subiectum secundum quod motus diffinitur in quinto *Phisicorum* (8), videlicet quod sit transmutacio a subiecto in subiectum, et subiectum vocat ibi illud quod est vere subiectum transmutacionis manens, secundum substanciam suam, in actu transmutatum. Tamen secundum contrarias qualitates vel quantitates vel ubi quod non accidit in genere simpliciter et corrupcione simpliciter videlicet substancie, quia generacio secundum quid et corrupcio secundum quid est in aliis predicamentis, et illis eciam quodammodo distinguntur generacione et corrupcio ab aliis motibus penes terminos, scilicet quod generacio est a non albo in album, et corrupcio ab albo in non album. Sed alteracio qui est motus est ab albo in nigrum vel econtrario. Unde generacio et corrupcio sunt inter contrarie opposita, alteracio et ceteri motus inter contraria. Unde differencia duplex est inter generacionem et corrupcionem et inter motus tres dictos : una est penes terminos, ut dictum est, alia est penes subiectum, quia motus illi sunt transmutabiles circa subiectum manens in actu et esse specifico. Generacio et corrupcio non sic, sed circa subiectum quod est de sui natura in potencia ad duplex esse specificum, quoniam tale subiectum est res et natura alicuius generis que aliquando est sub una differencia specifica, aliquando sub alia, et transmutatur ab una in aliam. Unde subiectum propriissimum motuum dictorum est in specie specialissima aliquod individuum illius; subiectum in generacione et corrupcione est individuum teneris alicuius quod potest ire in individua duarum specierum. Non tamen excludo quin ipsum genus sit subiectum in generacione et corrupcione et ipsa species sit subiectum in motibus tribus, sed tamen principale subiectum est individuum sive generis sive speciei, quia actus et operaciones et generaciones et corrupciones sunt universaliter primo et per se singularium, ut Aristoteles multociens dicit. Non enim fit homo albus per alteracionem, nisi quia aliquod individuum eius principaliter alteretur, neque transmutatur genus universale in species contrarias universales, nisi quia individuum generis transmutatur (in) individua diversarum specierum. Sumendo ergo motum non improprie sed proprie generacio et corrupcio sunt motus prout accipitur in diffinicione temporis, licet in alia significacione motus qua utitur in quinto *Phisicorum* (9) dicantur motus. Et licet largius et communius sumatur motus in diffinicione temporis, non tamen impro-

(6) Ch. 14; 15^{a} 13-32.
(7) III, I; 201^{a} 13.
(8) V, I; 225^{a} 4.
(9) V, 1, 2, *passim*.

prie sicut hoc nomen relacio quod signat genus generalissimum sumitur improprie, sed relacio que est species opposicionis in illo predicamento accipiatur striccius. Unde est equivocacio motus sicut relacionis, et huiusmodi equivocacio accidit in multis, ut alibi patet. Est igitur in ista transmutacione aliquid divisibile quod est motus. Indivisibile autem respondens motui aliquando nominatur mutatum esse, aliquando mutacio, quia Aristoteles dicit in sexto *Phisicorum*,(10) quod omnes (a)motus terminantur ad mutacionem et ad mutatum esse,et hec computantur pro

a) *cod.* omnis.

eodem, quia quod mutatur simul mutatur et mutatum est. Unde mutacio non precedit mutatum esse aliquo genere (*seq. mutacionis*) duracionis, et potest istud indivisibile nominari motum esse. Unde ista tria concurrunt in idem : motum esse, mutatum esse et mutacio. Indivisibilia enim sunt et simul sunt semper, licet differant in racione, quia ymaginamus prius motum esse, secundo mutacionem, tercio mutatum esse. Ergo motum esse et mutatum esse et mutacio sunt in instanti, quia sicut motus se habet ad tempus, sic finis motus ad finem temporis. Sed iste motus non potest esse nisi corrupcio quedam, neque similiter hec mutacio eo quod habentur pro transmutacione que est corrupcio termini a quo (*seq. g°n'o*) duplex est corrupcio : una erit divisibilis, que est motus, alia est indivisibilis, que est mutacio subita in non esse et completa, quare corrupcio que est motus erit tempore, et corrupcio que est mutacio erit in instanti et fine temporis, sed ante instans (*seq. spatium*) in *a* tempore fit motus, sed quod movetur est semper sub termino a quo, ut Aristoteles dicit in quinto et sexto *Phisicorum*, licet semper amittat aliquid de illo termino et ideo in corrupcione que est motus semper est ignis, propter quod dicitur in quinto *Phisicorum* quod necesse est esse quod corrumpitur. Ista auctoritas intelligenda est de corrupcione que est motus,et ita in (a)

a) in *add. in marg. manu prima.*

instanti erit corrupcio mutacio et primo habetur non esse termini a quo complete. Et ideo dicetur quod nunc primo non est ignis (f. 93[B]) loquendo secundum totum et simpliciter et complete de non igne, quia prius fuit aliquo modo non ignis secundum quid et secundum partem et incomplete. Sed hoc non denominat subiectum transmutacionis sicut neque alia que sunt secundum quid. Cum ergo corrupcio motus est in tempore *a* et corrupcio mutacio est in instanti *c*, in illo *c* erit primo non ignis simpliciter, sicut in toto *a* est ignis simpliciter, et *a* tempus non potest habere a parte post nisi unum instans quod est *c*, ergo non contingit assignare illud *c* ultimo esse ignis, ut dicatur nunc ultimo est ignis, scilicet in *c*, quia iam non est ignis. Preterea ultimum in esse ignis non potest esse nisi sicut ultimum in tempore et ultimum in motu, quo corrumpitur illud esse ignis in *a* tempore. Hec enim tria habent parem divisionem et extensionem equalem sed in tempore potest esse ultimum duplex : aut terminus, quod est instans ut *c*, aut aliqua pars insensibilis que tamen erit tempus, quia tempus dividitur in tempora in infinitum. Similiter in motu erit ultimum uno modo motum esse vel mutatum esse vel mutacio secundum quod diversimode significatur, alio modo aliqua pars motus insensibilis, ergo similiter erit in esse ignis. Uno modo erit aliqua pars potens denominare subiectum, et hoc semper erit in parte temporis et in parte motus et nuncquam in instanti, et dicetur tunc de illa, nunc ultimo est ignis, sed istud 'nunc' non est instans sed tempus insensibile. Alio modo erit terminus esse ignis, scilicet non esse quod est terminus extra, et tale est in instanti quod similiter est quodammodo extra substanciam temporis. Non semper debetur instans non esse termini a quo et non

(10) VI, 4; 234[b] 10[ff].

eius esse. Item si in illo instanti *c* contingeret dicere quod nunc ultimo est ignis, tunc non compleretur transmutacio in tempore dato nec terminus ad quem adquireretur in illo neque non esse termini a quo, que sunt contra ypostasim. Item tunc oporteret ponere unum instans novum sequens *c*, aut tempus aliud non tempus, quia aut esset continuum aut discontinuum. Si discontinuum ergo non continuaretur transmutacio, neque esset una corrupcio vel una generacio. Si dicatur quod, licet tempus proprium sit discontinuum tamen tempus continue est unum, istud non potest esse, quia secundum Aristotelem et Avicennam et omnes, non est nisi unum tempus numero in quo omnes motus simul existunt, puta iste transmutaciones sunt proprie quare fient penes duracionem propriam, ergo discontinuabuntur sicut tempora propria. Non autem erit tempus continuum, quia res permanens est tota simul et contingit sumere primum (*seq. e*) in esse eius, sed tempus non est totum simul neque aliqua pars temporis neque contingit sumere primum in eo quod sit de substancia temporis, quia est divisibilis in infinitum. Ergo nuncquam contingeret dicere secundum veritatem, quod nunc primo est non ignis vel non aqua, et ita in nulla parte temporis contingit dicere nunc primo est aqua vel non ignis, neque est aliud primum in illo tempore, secundo quam *c* instans in quo non potest dici secundum hanc posicionem quod sit non ignis, quia datum est quod in eo sit ultimo ignis. Item non esse ignis est terminus finalis corrupcionis et motus, ergo, secundum predicta, illud in quo adquiritur erit terminus finalis temporis mensurantis corrupcionem illam. Sed hoc non est tempus aliquod, ergo non erit tempus in quo adquiritur non ignis, quare non sequitur tempus neque continuum neque discontinuum in quo adquiratur. Si vero dicatur quod instans aliud sequitur, tunc, cum instans non sit nisi in tempore, sequetur aliud tempus discontinuum. Sed hoc stare non potest, ut dictum est, tum quia non erit transmutacio continua, tum quia neque instans secundum neque tempus suum potest esse terminus temporis precedentis, quia *c* est eius terminus. Sed terminus ad quem adquiritur in fine temporis mensurantis esse termini a quo, et mutacio, que est finis motus, est in fine temporis mensurantis motum. Ergo relinquitur quod non potest dari neque aliud instans, et ita neque aliud tempus, et ita in tempore dato, scilicet *a* cum suo instanti complebitur transmutacio tota ut dictum. Item melius est facere per unum quam per plura, si fieri potest per unum, et natura semper operatur breviori modo. Sed tota hec transmutacio potest salvari modo predicto, ergo non debet poni nisi unum tempus cum uno instanti. Item tempus duplex proprium esse ibi non potest, ut tactum est, quia una est transmutacio propria. Item (*seq. spatium*) si esset nichil faceret, cum non sit hic transmutacio aliqua communis et due proprie. Item non sunt duo tempora alia continue et proprium, sicut patet per omnes, neque possent esse duo tempora(11) simul, ut Aristoteles dicit, neque duo instancia, neque duo anni, neque duo menses, neque duo dies. Unde patet quod tempus illud quod mensurat motum celi mensurat omnia simul et semel, et hoc patet per unitatem temporis, si quis sciret eam dare. Fit ergo corrupcio, que est motus in *a* tempore et in fine temporis, quod est *c*, fit corrupcio completa in quo adquiritur finalis adnichilacio termini a quo. Sed generacio unius est corrupcio alterius et ideo concurrunt simul, et est duplex generacio termini ad quem una successiva, et hoc fit in toto *a* tempore, alia instantanea et subita et completa, et hoc fit in termino temporis, scilicet in *c*, et ita in toto *a* non est aqua, et in *c* est primo aqua.

Boulder, Colorado. S. HARRISON THOMSON.

(11) see R. BACON, *Communia Naturalia*, p. 163.

Eastern Missions of the Hungarian Dominicans in the first half of the thirteenth century

PIAN DE CARPINE (1) and WILLIAM OF RUBRUQUIS (2) are considered pioneers in the field of eastern exploration and the interesting accounts they have left are important geographical and historical sources. These journeys were not the first of their kind, however, although usually so considered. They were preceded by several trips taken by Hungarian Dominicans (3), but, although these journeys are well known to Hungarian historians, they have escaped the attention of historians in other countries in spite of the fact that the last journey of the Dominicans is mentioned by ALBERICUS TRIUM FONTIUM in his chronicle for the year 1237. He says : „Rumors having got abroad that the Tartar nation wished to invade Comania and Hungary, four preaching friars travelled for an hundred days as far as Old Hungary, and they on their return stated that the Tartars had already invaded Old Hungary and reduced it to their rule."(4) RUBRUQUIS also mentions them in referring to the land of Pascatir. „ That which I have told of the land of Pascatir I know from the preaching friars who went there before the advent of the Tartars..."(5) These two passages have been noticed by BEAZLEY and by ROCK-

(1) PIAN DE CARPINE, Italian Franciscan, was sent by INNOCENT the Fourth on a diplomatic mission to the Mongols (1243-1254). He related his journey in *Historia Mongolorum*. GEORGE SARTON, *Introduction to the History of Science*, Volume II, pp. 640-641.

(2) WILLIAM OF RUBRUQUIS, Flemish Franciscan, was sent by ST. LOUIS to Mongolia as an unofficial representative, 1253-1255. GEORGE SARTON, *Introduction to the History of Science*, Volume II, pp. 1053-1054.

(3) The Dominican Order was established in Hungary in 1225.

(4) W. W. ROCKHILL : *The Journey of William of Rubruck to the Eastern Parts of the World*, p. 131. I have quoted the passage as translated by ROCKHILL.

(5) *Ibid.*, pp. 130-131.

HILL. ROCKHILL remarks : „This early mission of the Dominicans seems to have been overlooked by the historians of the Order. The only reference I have found to it is in ALBERICUS TRIUM FONTIUM (*Chronicon*, 564)..."(6) BEAZLEY merely says : „The latter," referring to RUBRUQUIS, „preserves a curious history of a Dominican mission from the Theiss in New Hungary to the Bashkirs of Old Hungary, noticed by ALBERIC TROIS-FONTAINES..."(7)

It is strange that they could not find more information on this topic, for the relevant documents have been published several times. They consist of two reports in the Vatican Library. The first one is addressed to Pope GREGORY the Ninth (1227-1241) and is written by a Dominican called RICARDUS. The second one is a letter addressed to the Bishop of Perugia in his capacity of Papal Legate and is written by JULIAN, whose journey constitutes the main subject of the report of RICARDUS.

The account of RICARDUS exists in two independent copies. One was discovered in the Vatican Library in the *Codex Liber Censuum Apostolicae* of the thirteenth century by I. J. DEZSERICKY, who published it in a work called *De initiis ac majoribus Hungarorum* in 1748. BEDA DUDIK found a similar document in the Vatican in *Codex Bibliotheca Palatina* and mentions it in *Iter Romanum*. The question whether RICARDUS was the original author who had received the report personally from JULIAN or whether he merely copied the material from the archives of the Hungarian Dominicans is not settled.

The second report was first published by GUSTAVUS WENZEL in two forms. The first variant is taken from HORMAYR-HORTENBURG, *Die goldene Chronik von Hohenschwangau* following JOHANN FRISORI BÖHMER's report. The other version was found by BEDA DUDIK in the Vatican and was published in *Iter Romanum*. The two versions agree almost completely except that the Vatican MS is longer and has some additional material at the end (8).

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(6) *Ibid.*, p. 131.

(7) C. R. BEAZLEY : *The Texts and Versions of John de Plano Carpini and William de Rubruquis*, p. 285.

(8) This bibliography is taken from NIKOLAUS PFEIFFER : *Die ungarische Dominikanerordensprovinz von ihrer Gründung 122 1bis zur Tatarenverwüstung* 1241-1242,

These documents are not dated but there are many external circumstances as well as internal evidence through which the approximate time of the journeys can be fixed with a fair amount of certainty. In the account of RICARDUS we find that the second journey was begun while the future BÉLA the Fourth was still crown prince. ANDREW the Second, king of Hungary, died in September 1235 and BÉLA was crowned king of Hungary in October 1235. Accordingly, JULIAN must have started before September 1235. Hence, the preceding journey which took three years could not have started later than 1232. These limiting dates leave uncertainty only with respect to a short period as it does not seem probable that the journeys were very far apart in time.

The second report could not have been written before 1237 as it is addressed to the Bishop of Perugia as Papal Legate and he became Papal Legate on May 31, 1237. Of course, the journeys may have been earlier than this year but they could not have been later because JULIAN describes the ruler of Susdal and his court in the report, but by 1238 both ruler and court had been swept away by the Tartars (9). Another piece of evidence that the journeys could not have been later than 1237 is the previously cited passage from ALBERICUS TRIUM FONTIUM.

Although we can not ascertain the exact dates of these journeys, the evidence seems clear enough that they must have taken place before 1237 and this establishes the fact that the Hungarian Dominicans were the first travellers to the eastern boundaries of Europe of whom we have record. It is quite natural that Hungarians should have been pioneers in this field of exploration. Beside missionary zeal, they were inspired by motives peculiar to their nationality and to their geographical position. As RICARDUS mentions in the beginning of his letter, the Hungarians were anxious to find their former home and their relatives who had remained there. This may seem a far-fetched and romantic notion to other people but it had always been very real to Hungarians and inspired even such serious scholars as KÖRÖSY CSOMA

pp. 93-94, pp. 102-103 and also from J. SZINNYEI : *Magyar Irok Élete és Munkài*, Volume V, 1891.

The discussion of the dating of the documents is also taken largely from PFEIFFER.

(9) ALFRED RAMBAUD : *The History of Russia*, translated by L. B. LANG, Volume I, p. 116, "Souzdal, Rostof, Jaroslav, fourteen towns, a multitude of villages in the Grand Principality, were all given over to the flames (1238)."

and VÁMBÉRY (10). A more urgent and practical reason was the fear of the Tartars whose threatening invasion was again a much more serious problem to Hungarians than to more western peoples. Rumours of the Tartar conquests had already reached Hungary and it was of prime importance to obtain reliable information about the approaching menace. It was chiefly for this reason that the brothers received royal aid and patronage for their plans.

Two journeys are described in the report by RICARDUS. The first one is barely mentioned and the document is devoted to a detailed account of the experiences of the monk, JULIAN. RICARDUS opens his account by explaining the motives for the journeys (11). „It was written in the gestes of the Christian Hungarians that there was another, greater Hungary from which seven leaders went out with their people in order to seek another place to settle... they finally came into the land which is now called Hungary.... Finally they were converted to the Catholic faith... while those Hungarians from whom they had descended have remained in permanent infidelity and are pagans to this day. The preaching brothers when they have read these things...took pity on the Hungarians from whom they knew they had descended because they still remained in the error of infidelity and sent four brothers to seek them wherever they could." This is how the first journey originated, evidently from purely missionary and patriotic motives for as yet there is no mention of the Tartars.

The brothers set out without any planned itinerary for „they knew from ancient writings that they", the pagan Hungarians, „were toward the east but they did not know where". They travelled for three years encountering so much hardship and difficulty on the way that only one of them returned, „a priest called OTTO, who travelled disguised as a merchant", but he

(10) VÁMBÉRY, by the way, arrived at conclusions concerning the origin of the Magyars very different from those which seem indicated by JULIAN's account. He was a linguist, however, not a historian and his adverse criticism of the two reports concerning the journeys is not based on careful historical considerations. See H. VÁMBÉRY, *Der Ursprung der Magyaren*, Leipzig, 1882.

VÁMBÉRY's criticism is very fully discussed by PFEIFFER in *Die ungarische Dominikanerordensprovinz*, pp. 107-112.

(11) The quotations in the following discussion are from the account of RICARDUS which I have translated from the Latin text published by N. PFEIFFER in *Die ungarische Dominikanerordensprovinz*, pp. 198-206.

brought good news. „He, in a certain kingdom of the pagans, recognized a few Hungarians by their speech and found out where they lived, but he did not enter their province. He returned immediately to Hungary for more brothers who should return with him to preach the Catholic faith". The heroic brother could not accomplish his purpose for „having been broken down by all the hardships, he died on the eighth day after his return after he had explained the whole way to those who wished to seek it". The Dominicans, undaunted by this sad example, sent out another group of four brothers. They took more precautions this time for they „changed their regular habits for secular ones and let their hair and beards grow in the manner of the barbarians".

Prince BÉLA, the heir apparent, gave them escort as far as Constantinople. The dangerous and novel part of the journey began there and thus it is from this point that the account of people and of places is given in some detail. I think it is of interest to note whenever these descriptions agree with those of CARPINE and of RUBRUQUIS. Such an agreement does not necessarily mean that the later authors took the material from the earlier ones but rather it may strengthen the evidence as to the reliability of observations which are corroborated by the different travellers.

At Constantinople, the Dominicans „embarked on the sea and after thirty-three days came to a land called Sychia (12) into a

(12) Sychia is probably the Zichia mentioned by RUBRUQUIS. ROCKHILL's

town called Matrica (13). The ruler and people of this land call themselves Christians and have Greek letters and priests". Here they spent fifty days and gained the favor of the chief wife of the prince. She gave them advice and provisions and they set out through a desert „where they found neither dwellings nor men".

After thirteen days, they arrived into Alania(14) „where Christians and pagans are found together." A rather detailed description follows concerning the quarrelsome and barbarous habits of the Alanians and their many superstitions. Here they could not find travelling companions for a long time on account of the fear of the Tartars. They had to endure such great misery that finally two of the brothers turned back. JULIAN and another priest called GERARDUS remained. After a while, they found companions and set out through the desert.(15) „On the thirty-seventh day, they came into the territory of the Saracens called Vela into the town of Bundaz." It seems very probable that JULIAN mixes the name of the country with the name of the people who were called Belars(16) by some writers. There is also a possibility

edition, p. 45, "Beyond this opening", the mouth of the river Tanais, "is Zikuia, which does not obey the Tartars." ROCKHILL makes the following comment on the same passage, pp. 45-46 : „CONSTANTIN PORPHYROGENITUS (*De admin.* 181) says : '18 or 20 miles from Tamatarcha (Matrica) is the river Ucruch which separates Zichia from it; from the Ucruch (probably a branch of the Kuban) to the river Nicophin was Zichia.'"

(13) ROCKHILL, *op. cit.*, pp. 44-45, „Matrica... was situated on the Taman peninsula near the straits of Kertch and on a branch of the Kuban river... in1230 we hear of Matrica as having a Greek prince, people and clergy."

(14) RUBRUQUIS, ROCKHILL's edition, pp. 88-89, „On Pentecost eve there came to us certain Alans, who are there called Aas, and they are Christians according to the Greek rite, and use the Greek writing and have Greek priests. They are not however scismatics like the Greeks, for without any respect to persons they honour all Christians."

ROCKHILL, *op. cit.*, p. 89, „It is thought that the Oss or Ossetes of the Caucasus are their modern representatives."

(15) RUBRUQUIS, ROCKHILL's edition, p. 122, „From the Iron Gate, which is the door out of Persia, there are more than thirty days through the desert, going up along the Etilia, to this Bulgaria, along which route there is no city, only some villages near where the Etilia falls into the sea; and these Bulgarians are the worst kind of Saracens, keeping the law of Machomet as no others."

(16) D'AVEZAC : *Relation des Mongols ou Tartares par le Frère Jean du Plan de Carpin*, p. 490, „...les Bilères ou habitants de la grande Boulgarie, c'est-à-dire les Boulgares du Wolga, appelés BELÂR par ABOULFÉDÂ et par RESCHYD-EL-DIN..."

that this may have been the country of the Berthas(17) which D'AVEZAC places south of Bulgaria. Here the brothers were treated in a friendly manner. Indeed, if we may believe JULIAN, the prince declared publicly his readiness to be converted. From here, they went to another city which is not named. There GERARDUS died in the house of a Saracen „who had received them in the name of God."

JULIAN, who was now completely alone, became the servant of a Saracen priest and of his wife and travelled with them to Great Bulgaria. There, in a large city „said to have fifty thousand warriors," JULIAN found a Hungarian woman who was brought to this place by her husband. She told him the way to Greater Hungary and assured him that he would find it in ten days. Without going into details about the journey, he states briefly that this was done. He found the Hungarians near the river Ethyl(18). „They had the Hungarian speech everywhere and they understood him and he understood them."(19) They knew „by

(17) D'AVEZAC, *op. cit.* There is an interesting discussion of the probable location of the Berthas on page 492.

(18) Ethyl is the old name for the Volga by all authorities.

(19) CARPINE, ROCKHILL's edition, p. 12, „Comania hath to the north of it immediately after Ruscia, the Morduins, the Bilers, or great Bulgaria, the Bascarts or great Hungary."

RUBRUQUIS, ROCKHILL's edition, p. 129, „After travelling xii days from the Etilia, we found a great river which they call Jagac, and it comes from the country of Pascatir in the north.... The language of Pascatir is the same as that of the Hungarians, and they are shepherds without any towns whatever, and on the west this country confines on Greater Bulgaria. From this country eastward, and on that side to the north, there are no more towns; so Greater Bulgaria is the last country with towns."

ROCKHILL, *op. cit.*, p. 129, note 3, „The Bashkirds...are of Finnish stock, and now speak a Turkish dialect...Mussulman historians of that period identified the Bashkirds with the Hungarians."

D'AVEZAC, *op. cit.*, p. 491, „...les Bascarts ou habitants de la Grande-Hongrie, dans lesquels il est aisé de reconnaître par leur nom les peuples cantonnés aujourd'hui dans les gouvernements de Perm, de Viatka, et d'Orenbourg, et appelés par les Russes Baschkourts...parlant un dialecte turk, mais offrant dans leurs traits physiques des caractères étrangers à la race turke : le nom de Grande-Hongrie donné à leurs pays révèle l'opinion qu'on avait au moyen âge sur leur affinité d'origine avec les Hongrois, et GUILLAUME DE RUBRUK déclare même expressément que la langue des deux peuples était identique; or les Hongrois sont bien reconnus aujourd'hui pour appartenir à la grande famille finnoise, ainsi que leur idiome national en fait encore foi; il y a sans doute lieu de penser dès lors que les Baschqirds restés dans l'ancienne patrie commune sont pareillement d'origine finnoise,

old stories" about the other Hungarians and showed great interest in hearing about them. They did not cultivate the land but kept many horses and lived mostly on the flesh and milk of horses. Their land bordered on that of the Tartars but they were not afraid of them for, as JULIAN says, „these Tartars when they join in battle with the Hungarians are not able to conquer them, in fact, they are always overcome in the first battle. For this reason, they chose them as allies and friends. Thus joined together, they destroyed fifteen nations." JULIAN met many Tartars among the Hungarians. One of these was a messenger from the chief of the Tartars who informed JULIAN that they were planning to go against Alemania. When JULIAN heard these news, he started back immediately. He left on the twenty-first of June and travelling by a shorter way shown him by the Hungarians, arrived home on the twenty-seventh of December. He does not say much about this return trip except that he crossed the country of the Mordvani(20) in fifteen days „by means of a river" and travelled on horseback through Rucia and Polonia. As a sort of postscript, the last paragraph is devoted to the ferocious customs of the Mordvani, who were evidently in sore need of Christian enlightenment.

As it is evident from the foregoing description, JULIAN did not take very much interest in geography. The towns in Bulgaria are not mentioned by name and he does not describe exactly the way to Greater Hungary nor the extent of that country or its characteristics. Nevertheless, the information in this report is very detailed, indeed, compared to the second one which really has more of a historical than a geographical interest. This is a letter addressed to the Bishop of Perugia and is devoted mostly to a description of the Tartars, their probable origin and customs which JULIAN had from hearsay. He was greatly impressed by the menace approaching Europe and wished to arouse the interest and concern of the church dignitaries.

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mais que mêlés de Mongols et de Turks, ils se sont à la longue complètement nationalisés parmi ces derniers."

(20) BEAZLEY, *op. cit.*, p. 285, note 7, „The Morduans, or as they are called later...Morduyni, are the Finnish Mordvins of the Middle Volga : traces of them are found in Kazan, Penza, Simbirsk, Saratov, Astrakhan, and Orenburg provinces; they are now almost entirely Russianized."

JULIAN and his companions travelled as far as Suzdal (21) on the third journey. There they found out that the Bulgars and the pagan Hungarians had been conquered by the Tartars so that they did not try to go farther but having found out as much as they could about the Tartars hastened home with the information. The first few pages of the letter are devoted to an account of the rise of the Tartars. I have not found parallels to this story in the works of the other travellers and as it does not seem significant, I shall not discuss it. (22) The letter becomes more interesting when JULIAN describes the palace of the Khan, the customs of his court, and the Tartar manner of waging war. These passages are largely corroborated by the accounts of eye witnesses and serve to show that JULIAN reported faithfully what he had heard without indulging in flights of imagination. I shall summarize his account very briefly. The prince of the Tartars has a palace in Ornach (23). This palace is so great that a thousand horsemen can enter through one gate. The prince is attired in glorious raiment and sits on a golden couch (24) supported by golden columns and decorated with precious things. All the thresholds of his palace are golden and strangers must cross them with the greatest reverence. If a stranger touches the threshold with his foot, he is immediately put to death. (25) The prince lives in such pomp and sends his armies to many lands. He is sending one army across the sea, another against the Cumanians, who had

(21) ALFRED RAMBAUD, *op. cit.*, p. 74, „The double principalities of Souzdal, with their towns of Souzdal, Rostof...were situated on the Volga and the Oka amongst the thickest of northern forests, and in the middle of the Finnish tribes of Mouromians."

(22) BEDA DUDIK mentions that there is a somewhat similar story in *Yaroslav* of the Königinhofer MS, BEDA DUDIK, *Iter Romanum* ; Wien, 1855. Vol, I, p. 328, note 1.

(23) The location of this city has not been settled. D'AVEZAC thinks that it was the ancient Tana. See p. 510, *op. cit.* ROCKHILL is more inclined to suppose that it was near Otrar on the lower Syr Darya. It may also be a corruption of Kurganj or Urgenj, see ROCKHILL, *op. cit.*, p. 14, and BEAZLEY, *op. cit.*, p. 284.

(24) RUBRUQUIS, BEAZLEY's edition, p.219, „BAATU himselfe sate upon a seate long and broad like unto a bed, guilt all over, with three staires to ascend thereunto..."

(25) CARPINE, BEAZLEY's edition, p. 113, „Likewise, whosoever treads upon the threshold of any of their dukes tabernacles, he is put to death." For passages mentioning this superstition, see RUBRUQUIS, ROCKHILL's edition, pp. 188-189, p. 192 also MARCO POLO, YULE's edition, vol. II p. 383.

fled to Hungary, and a third army against Russia. In war, they send their arrows farther than any other people so that they seem to rain arrows. They use the conquered people as soldiers. These soldiers are arranged in wedgelike formations and divided into groups of ten. Each of these groups has a Tartar leader and there is a Tartar captain over every hundred. The people are assembled from so many nations that they can not understand each other and therefore can not commit treachery. These soldiers fight very well for if they retreat the Tartars shoot them from behind. They do not attack fortified towns but devastate the surrounding country and then command the captives to besiege their own fortifications. JULIAN does not estimate the size of the Tartar army but merely remarks that in conquered countries they compel all those who are able to fight to serve them (26).

Besides this information, JULIAN carried back the personal message from the Duke of Souzdal to the King of Hungary that the Tartars were plotting day and night to go against Hungary and planned to extend their conquests even to Rome and beyond Rome. The Duke also gave JULIAN a letter addressed to the King of Hungary which he had taken away from Tartar messengers whom he had intercepted. The letter is interesting as it agrees in style and content with the one that Friar ANDREW OF LONGJUMEAU (27) had to carry back to the King of France. JULIAN gives the translation in Latin. I do not know whether the original is extant or not. The two letters are appended to this paper (28).

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(26) CARPINE, BEAZLEY's edition, p. 125. „I deeme not any one kingdome or province able to resist them : because they use to take up souldiers out of every countrey of their dominions. And if so be the neighbour province which they invade, wil not aide them, utterly wasting it, with the inhabitants therof, whom they take from thence with them, they proceed on to fight against another countrey. And placing their captives in the forefront of the battell, if they fight not couragiously, they put them to the sworde."

Ibid., p. 124, „CHINGIS CHAN divided his Tartars by captaines of ten, captaines of an 100, and captaines of a 1000."

See also MARCO POLO, YULE's edition, Vol. I, p. 261 for an almost similar description.

(27) French Dominican who accompanied ASCELIN in a mission to the Western Mongols in 1247. In 1248, he was sent by ST. LOUIS on a new mission to a Mongol general. G. SARTON, *Introduction to the History of Science*, Volume II, p. 642.

(28) The subsequent history of the letter is related in the following way by B. HOMAN in *Magyar Történet*, Volume II, p. 124, „The report was sent to BÉLA's

JULIAN went to Rome, probably to report personally to the Pope about these important matters for he says that while he remained in the "Roman Curia" four brothers preceded him on a fourth journey to the boundaries of Souzdal. There they met pagan Hungarians fleeing from the Tartars and converted them. The Duke of Souzdal was angered by this missionary activity and ordered the brothers out of the country. Thereupon, not wishing to return, they went to a place called Recessue, which I could not identify. They planned to travel from there to Greater Hungary, to the Mordvani, and even to the Tartars. Two brothers went to the Mordvani while the other two waited for them. They were probably killed for they never returned and the messenger who was sent after them was put to death.Then, JULIAN, who must have joined them in the meanwhile, seeing the destruction and turmoil all around,decided that the time was not fit for missionary work and they returned to Hungary. He warns the Bishop again that the "scourge of God" is approaching and that the church should protect itself and its children.

This was the last journey of the Dominicans for soon afterwards JULIAN's predictions came true. The Tartars invaded Hungary in 1242 and this calamity put an end for a long time to all missionary and exploring projects in Hungary.

Although JULIAN and his companions did not succeed in their cherished aim of uniting the Christian Hungarians and their pagan brothers, nor could they organize the much more needed resistance against the Tartars, nevertheless, their efforts are significant. In the first place, their example of unblenching heroism in the face of great dangers is worthy of respect and their modesty and good sense sets an example to other travellers. Besides, their journeys establish the important fact that in the thirteenth century there were Hungarians somewhere between the Volga and the Ural. They were not merely a related tribe speaking a somewhat similar Ural-Altaic language. JULIAN is quite explicit on the point

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uncle, BERTHOLD, Patriarch of Aquileia and to SALVIUS, Bishop of Perugia. BERTHOLD passed on the information to the neighboring church dignitaries and nobility while through the Papal Legate the news became known in Rome and in the western countries. Church services were held throughout Europe that God may avert this calamity from the Christian world but no one offered to help BÉLA or to prepare seriously for defense."

that they spoke Hungarian and he could understand them without any difficulty. Finally, the knowledge they have gained through so much suffering and through the loss of so many lives was probably of help to the later travellers. That RUBRUQUIS knew of their travels is proved by the quotation already cited. It is not even out of the question that they may have met personally as JULIAN had been to Rome. JULIAN may have met CARPINE also or, at any rate, CARPINE may have heard about him from the Bishop of Perugia since CARPINE's birthplace is near the seat of the Bishop. Of course, all this is merely a matter of conjecture which probably will never be proved one way or another. It is a fact, however, that the last journey is mentioned by ALBERICUS TRIUM FONTIUM as has also been cited and it seems most probable that the trips were quite well known in clerical circles. Finally, in considering the achievements of the brothers, which seem very simple, indeed, compared to the accomplishments of their successors, it should be kept in mind that although the first steps seem crude and simple they are the hardest to make. It should be remembered that to the Dominicans belongs the honor of opening up a new way to Asia and of arousing interest and the desire of missionary work in the eastern countries.

I wish to thank Dr. ERWIN RAISZ and Dr. MARY CATHERINE WELBORN for their generous help which made the writing of this article possible. DR. RAISZ had helped me to identify some of the places mentioned in the paper, indicated them on the map and drew JULIAN's route. MISS WELBORN had supervised and corrected my translation from the Latin.

(*Cambridge, Massachusetts*) MARY DIENES.

APPENDIX

De Facto Hungariae magnae a fratre RICARDO (JULIANO) invento tempore GREGORII papae noni.

(*Lib. censuum Cam. Apost.* fol. 445. From *Vetera monumenta historica Hungariam sacram illustrantia* ... ab AUGUSTINO THEINER ... Romae, Typis Vaticanis ... 1859-1860).

It was written in the gestes of the Christian Hungarians that there was another, greater Hungary from which seven leaders went out with their people in order to seek another place to settle because the land could not sustain such a great number of inhabitants. After they had crossed and destroyed many kingdoms, they finally came into the land which is now called Hungary and which was at that time called the "Pasture of the Romans". After they had subdued the population that lived there at that time, they chose this place for settling in preference to other lands. Finally, they were converted to the Catholic faith through SAINT STEPHEN, the first king, while those Hungarians from whom they had descended have remained in permanent infidelity and are pagans to this day.

The preaching brothers when they had read these things in history, took pity on the Hungarians from whom they knew they had descended because they still remained in the error of infidelity and sent four brothers to seek them wherever they could and to find them, God willing. They knew from ancient writings that they were toward the east but they did not know where. The brothers who had been sent, sought them continually through many hardships on sea and land for three years but could not find them on account of the many difficulties of the way, except for one priest called OTTO, who travelled disguised as a merchant. He, in a certain kingdom of the pagans, recognized a few Hungarians by their speech and found out where they lived, but he did not enter their province. He returned immediately to Hungary for more brothers who should go back with him to preach the Catholic faith. But having been broken down by all the hardships, he died on the eighth day after his return after he had explained the whole route to those who wished to seek it.

The preaching brothers, wishing the conversion of the infidel, sent four brothers for the second time to find the people in question. These, after they had accepted the benediction of their brothers, had changed their regular habits for secular ones, and had let their hair and beards grow in the manner of the barbarians, travelled to Constantinople. They were conducted through Bulgaria of the Assani and through Roumania at the expense of Prince BÉLA, now King of Hungary. At Constantinople, they embarked on the sea and after thirty-three days came to a land called Sychia into a town called Matrica. The ruler and people of this land call themselves Christians and have Greek letters and priests. The prince is said to have a hundred wives. All the men shave the whole head and cultivate their beards carefully, except the nobles who, as a sign of nobility, leave a few hairs over their left ear, the rest of the head being completely shaved. There they tarried for fifty days on account of a hope of alliance which they expected. Moreover, God gave them grace in the sight of the lady who was the greatest of the hundred wives of the king so that, to their wonder, she took

them into favor and provided them with all necessities. By the advice and aid of this lady, they went forward from there through the desert where they found neither dwellings nor men. They crossed in thirteen days. Finally, they came to a land called Alania where Christians and pagans are found together. There are as many princes as villages none of which owes allegiance to another. There is constant warfare, leader against leader and town against town. In the time of ploughing, all the armed men of one village go to the fields together. They reap at the same time and they cultivate a contiguous piece of land. All who have to collect firewood or have other duties outside the villages always go armed and accompanied. It is impossible for a small group to go out in any manner or for any reason without personal danger throughout the whole week. The Lord's day alone from dawn to sunset is an exception for it is observed with such devotion among them that at that time anyone, no matter how great a wrong he has done or how many adversaries he may have, may walk about safely, whether defenseless or armed, even among those whose relatives he had killed or upon whom he had inflicted other wrongs. Those who call themselves Christians observe the following rules, they do not drink or eat out of a vessel in which a mouse had died or from which a dog had eaten unless it is first blessed by their elder and whoever does differently is held a stranger to Christianity. If anyone of them kills a man for any reason, he receives neither blessing nor penitence on this account. Indeed, homicide is considered nothing among them. They hold the cross in such reverence that beggars, whether natives or strangers who are not able to have the multitude on their side may go about securely all the time if they place some kind of a cross on a javelin with a banner and hold it aloft.

The brothers were not able to procure companions to proceed with them from this place on account of the fear of the Tartars who were said to be near. For this reason two of them returned. The other two remained in this land in the greatest penury and delayed six months. During this time they had neither bread nor drink except water. But one of the brothers, a priest, prepared spoons and certain other things for which, once in a while, they received some millet which was not sufficient for their needs no matter how sparing they were. For this reason, they decided to sell two of their number on whose price they could finish the proposed journey; but no buyers appeared because they did not know how to reap or grind in a mill. Thus, compelled by necessity, two of them returned from that place to Hungary; the others remained there and refrained willingly from the completion of the journey. Finally, having obtained the company of certain pagans, they undertook the journey and went through the solitudes of the desert in thirty-seven days. During twenty days, they ate only two loaves of bread baked in the ashes and so small that in five days they finished them completely and even then were not satisfied. Whence, the brother who was healthy but without strength, led forth from the desert gladly inspite of the sorrow and trouble. Moreover, the infirm brother pitying the healthier one frequently said to him that he should leave him in the desert as a dead and maimed body lest through taking care of him he should neglect the work of God. The healthy brother did not consent but struggled to carry him along on the journey until the time of his death. When they asked their way, they were nearly killed by groups of pagans who believed that they had money.

Having crossed the desert without any road or path, on the thirty-seventh day they came into the territory of the Saracens called Vela and into the town of Bundaz, where they could find no shelter at all but had to remain in the field in rain and cold. During the day, the healthy brother sought food for himself

and for the sick brother in the city and was able to obtain drink and other things particularly from the prince of the town. The prince knew that he was a Christian and therefore offered him food gladly because both he and the people of this region said publicly that soon they will become Christians and subject to the Roman church. From there, they went to another town where the sick brother called GERARDUS, a priest, died in the house of a Saracen who had received them in the name of God, and was buried there. Shortly afterwards, brother JULIAN, who alone remained, since he did not know how to proceed, became the servant of a Saracen priest and his wife who set out for Great Bulgaria. Great Bulgaria is a large and powerful country with great cities but completely pagan. In this country, it is openly said that soon they will be made Christians and will subject themselves to the Roman church. They do not know, however, when this will happen. They have heard this from their elders. In one great city of the same province which is said to have fifty thousand warriors, the brother found a Hungarian woman who was brought to these parts by her husband from the land which he sought. She told the brother how he should go, asserting that without doubt he could find those Hungarians whom he sought in ten days. This was done.

He found them near the great river Ethyl. They were extremely glad when they saw him and heard of his arrival because he was a Christian Hungarian and they listened diligently to whatever he had to say concerning the faith and other things. They had the Hungarian speech everywhere and understood him and he understood them. They are pagans having no knowledge of any God but they do not venerate idols. They live like beasts. They do not cultivate the land but eat the meat of horses, wolves and such creatures. They drink the milk of horses and blood. They have a great number of horses and arms and they are most vigorous in battle. They know by old stories that the other Hungarians descended from these but they do not know where they are. There is a tribe of Tartars near them. These Tartars when they join battle with the Hungarians are not able to conquer them, in fact, they are always overcome in the first battle. For this reason they chose them as allies and friends. Thus joined together, they have destroyed fifteen nations. Brother JULIAN found Tartars in this land of the Hungarians and the messenger of the chief of the Tartars who knew Hungarian, Ruthenian, Cumanian, Teutonic, Sarracenic, and Tartar. This messenger said that the army of the Tartars which was about fifteen days distant from there wished to go against Alemania and that they were expecting another army which they had sent for the destruction of the Persians. He also said that beyond the land of the Tartars there was a race much more numerous in which all the men were taller and larger with heads so great that they did not seem to fit their bodies, and that these people intended to go out of their country to fight with all who should resist them and to devastate all the lands which they could subjugate. The brother departed after he had heard these things although he was invited to stay by the Hungarians. He departed for two reasons. In the first place, he thought that if the kingdoms of the pagans and the Ruthenians, which are situated between the Christian and the pagan Hungarians, should hear that the latter are converted to the Catholic faith, they would perhaps close the way to others since they would fear that if the two people should become joined, they would subjugate all the kingdoms in between. In the second place, he thought that if he should become sick or die in a short time, his labor would be in vain; neither would he succeed in those things nor would the brothers in Hungary know where this people was. Since, he thus

wished to return, the Hungarians showed him another way by which he could arrive more quickly. The brother started on his way back three days before the feast of the Nativity of the Blessed JOHN THE BAPTIST and, pausing only a few days in his trip whether on water or on land, entered Hungary on the second day after the Nativity of Our Lord. He travelled on horseback through Rucia and Polonia. In returning from the pagan Hungary, he crossed the country of the Mordvani by means of a river in fifteen days. The Mordvani are pagans and very cruel people because a man is held to be nothing if he had not killed a number of men. When anyone goes on a journey, the heads of all the men whom he had killed are carried in front of him and a man's reputation is measured according to the number of heads carried in front of him. They even make goblets from the heads of men and enjoy drinking from them. No one is allowed to marry who had not killed a man. These people learned from their prophets that they will become Christians and so they sent to the Duke of Great Laudameria, which is neighboring to the land of the Ruthenians, that he should send them a priest who would confer baptism on them. The Duke replied that this duty belonged not to him but to the Pope of Rome for the time is proper that we all should accept the faith of the Roman church and subject ourselves to it in obedience.

The letter of BATU KHAN to King BELA IV.

(From PFEIFFER, *opus citatum*, page 213)

Ego CHAYM nuncius regis coelestis cui dedit potentiam super terram subicientes in se exaltari, et deprimere adversantes. Miror de te, Rex Ungarie, quod cum miserim ad te iam tricesima vice legatos, quare ad me nullum remittis ex eisdem? Sed nec nuncios tuos vel litteras mihi remittis. Scio, quod rex dives es, et potens, et multos sub te habes milites, Solusque gubernas magnum regnum. Ideoque difficile sponte te mihi subicis, melius tibi tamen esset, et salubrius, si te subiceres sponte mihi. Intellexi insuper, quod Cumanos servos meos sub tua protectione detineas. Unde mando tibi, quod eos de cetero apud te non teneas, et me adversarium tibi non habeas propter istos, facilius enim est eis evadere, quam tibi, quia illi sine domibus cum tentoriis ambulantes, possunt forsitan evadere, tu autem in domibus habitans, habens castra et civitates, qualiter effugies manus meas?

The letter of the empress regent, OGUL GAIMISH to the king of France.

(From ROCKHILL, *The Journey of William of Rubruck to the Eastern Parts of the World*, page xxx)

Bone chose est de pez; quar en terre de pez manjuent cil qui vont à quatre piez, l'erbe pesiblement. Cil qui vont à deus labourent la terre dont les biens viennent passiblement. Et cete chose te mandons, nous pour toy aviser; car tu ne peus avoir pez se tu ne l'as à nous, et tel roy et tel (et moult en nommoient) et touz les avons mis à l'espée. Si te mandons qui tu non envoies tant de ton or et de ton argent chascun an, que tu nous retieignes à amis; et se tu ne le fais, nous destruirons toy et ta gent aussi comme nous avons fait ceulz que nous avons devant nommez.

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Rumphius, Plinius Indicus
(1628-1702)

After having obtained his B.S. in Harvard in 1864 under LOUIS AGASSIZ, ALBERT SMITH BICKMORE (1), a son of Maine with a fine enthusiasm for natural history, started for a long journey to the Far East. He visited the Malay peninsula, the Dutch Indies and Japan, being back in Boston in December 1867. According to the account in his book "Travels in the East Indian Archipelago" (2) :

"On the 19th of April, 1865, I was fifty miles east of Christmas Island, floating on the good ship "Memnon" toward the Strait of Sunda.

"I was going to Batavia, to sail thence to the Spice Islands, which lie east of Celebes, for the purpose of collecting the beautiful shells of those seas.

"I had chosen that in preference to any other part of the world, because the first collection of shells from the East that was ever described and figured with sufficient accuracy to be of any scientific value was made by RUMPHIUS, a doctor who lived many years at Amboina, the capital of those islands. His great work, the *Rariteit Kamer*, or Chamber of Curiosities, was published in 1705, more than sixty years before the twelfth edition of the *Systema Naturae* was issued by LINNAEUS, 'the Father of Natural History,' who referred to the figures in that

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(1) A. S. BICKMORE, born at Tenant's Harbor, Maine in 1839, died at Nonquitt, Massachusetts in 1914. He studied in Dartmouth and Harvard and was soon appointed assistant in the Harvard Museum of Comparative Anatomy. He travelled to the Far East in 1864-67. He was not a prominent naturalist, but is sure of immortality as the "father of the American Museum of Natural History". Indeed he it was who conceived the plan of it soon after his return from the East, and having enlisted a sufficient number of influential friends, he secured the initial organization of the Museum in 1869. He was the first superintendent of it from 1869 to 1884. Then having understood ahead of most people that the educational possibilities of the Museum were not sufficiently utilized he conceived a new plan of adaptation of the Museum to public education. In this he was I believe a pioneer, at least in America. He was the first curator of the Museum's Department of Public Education. See article by ELEANOR ROBINETTE DOBSON (DAB 2, 238-39, 1929).

(2) London 1868, but I quote from the New York edition of 1869. Both editions are apparently identical.

work to illustrate a part of his own writings. When Holland became a province of France, in 1811, and it was designed to make Paris the centre of science and literature in Europe, it is said that this collection was taken from Leyden to that city, and afterward returned, and that during these two transfers a large proportion of the specimens disappeared; and that, finally, what was left of this valuable collection was scattered through the great museum at Leyden. It was partly to restore RUMPHIUS's specimens, and partly to bring into our own country such a standard collection, that I was going to search myself for the shells figured in the *Rariteit Kamer*, on the very points and headlands, and in the very bays, where RUMPHIUS's specimens were found... " (p. 13-14).

"At first I bought them by the basketful, until all the more common species had been obtained, and then I showed the natives the figures in RUMPHIUS's *Rariteit Kamer* of those species I still wished to secure, and at the same time offered them an extra price for others not represented in that comprehensive work. One species I was particularly anxious to secure alive. It was the pearly nautilus. The shell has always been common, but the animal has seldom been described. The first was found at this place, and a description and drawing were given by RUMPHIUS. Afterward a dissection and drawing were given by Professor OWEN, of the Britisch Museum, and his monograph probably contains the most complete anatomical description that has ever been made of any animal from a single specimen. He worked, as he himself described it to me, with a dissecting knife in one hand and a pencil in the other. So little escaped his pen and pencil, that very little information has been added by later dissections. I was so anxious to secure one of these rare animals, that I felt that, if I should obtain one and a few more common species, I could feel that my long journey had been far from fruitless. Only the second day after my arrival, to my inexpressible delight, a native brought me one still *living*." (p. 134-5).

"It was my desire not only to obtain the same shells that RUMPHIUS figures, but to procure them from the same points and bays, so that there could be no doubt about the identity of my specimens with his drawings. I therefore proposed to travel along all the shores of Amboina and the neighboring islands, and trade with the natives of every village, so as to be sure of the localities myself, and, moreover, get specimens of all the species alive, and thus have ample material for studying their anatomy." (p. 141).

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Who was this RUMPHIUS whose ancient book had caused a young American zoologist to travel so far away from home and had fired his soul with so much enthusiasm for natural history? BICKMORE visited the tomb of RUMPHIUS in Amboina and apropos of that gives a short account of the latter's life (p. 251-52), but that account as well as his description of the tomb contain so many inaccuracies that it is better to disregard them (3). Let us

(3) I would not conclude that BICKMORE's book is bad. Its value can only be determined by a naturalist. Scientific books which are good in other respects

tell RUMPHIUS' story again. It is such a good story, and to my mind at least such a cheering one, that it cannot be told too often.

GEORGE EBERHARD RUMPF or RUMPHIUS(4) was born in or near Hanau on the River Main (a few miles from Frankfort) in 1627 or 1628 (the date of birth is uncertain; it was sometime between May 15 and July 7). The town of Hanau is famous for two other sons, the two brothers GRIMM, JACOB (1785-1863) — the founder of Germanic philology, the discoverer of "Grimm's law" of consonant shiftings (1822) and WILHELM (1786-1859), the main creator of "Grimm's tales", one of the founders of folklore. It is hardly possible for the inhabitants of Hanau or for its careful visitors to ignore the brothers GRIMM for a statue is dedicated to them, but how many know that that little city gave birth also to a third man at least as great as the two others? How many of the Hanauers themselves know of him I wonder?

GEORG RUMPHIUS was the son of a prosperous architect and he was educated in the local gymnasium. He soon developed a very adventurous spirit which must have disturbed the family and their anxiety was perhaps mixed with a feeling of relief when he was enlisted by the count LUDWIG VON SOLMS-GREIFENSTEIN (BRAUNFELS) so-to-say in the Venetian army, but in reality in the service of the Dutch West India Company. Those were golden days for the German princelings who could sell their subjects or dispose of them like heads of cattle. If the boy was in search of adventures he made a good bargain for he had plenty of them — adventures and catastrophes!

Catastrophe n° 1. — The boy boarded the "Swarte Raef" (Black raven) in Texel, sailing to Brazil, but the ship was captured by the Portuguese and every soldier which she carried was impressed into the Portuguese army. However, he turned this

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often contain inaccurate historical data; indeed conscientious scientists often lack historical feeling and have no appreciation of historical truth. Natural history they seem to think must be told accurately, but for human history anything goes!

(4) It is better to use the Latinized form RUMPHIUS which he always used himself, in his Dutch writings as well as in his Latin ones. However, in a letter to the directors of the Dutch East India company, dated August 20, 1663, he signed: "Jeuriaen Rumph van Hanau", also "Georgius Everhardus Rumphius van Hanau" *(Gedenkboek* 1902, p. 13).

grievous accident into a new opportunity. While serving in Portugal he heard so many stories of the wonders of the East Indies that his imagination was inflamed. In 1649, he was allowed to return to Hanau where he remained a few years, years of final preparation about which we would like to know more. At the end of 1652 — Aet. 24-25 — he took service as a warrant officer in the Dutch East India Company. He sailed again from Texel, the day after Christmas of that year — on the ship Muyden, arrived in Java in June 1653, and soon proceeded to Amboina where he landed toward the end of the same year.

Amboina (5) is one of the smaller islands of the Moluccas (or Spice Islands) but one of the most important, and the town in that island bearing the same name is the capital of the Moluccas. That archipelago had been conquered by the Portuguese about 1525, but the Dutch lured by the precious spices — nutmeg and clove — were soon hovering about it, full of covetousness, and their influence began to be felt early in the seventeenth century—at first in the southern part where Amboina is located.

To return to our hero the authorities soon realized that he had no taste for warfare and soon after his arrival he was transferred from the military to the civil service. He was appointed an under-merchant (onderkoopman) in 1657 and a merchant (koopman) in 1662. He seems to have done what was expected from him and to have been throughout a very faithful and helpful servant of the Company though his main interest was obviously in another direction. Whatever his training may have been, he was a born naturalist and one can easily imagine the impact of tropical nature — fantastic and equally alluring in its luxuriance and diversity — upon a young mind thus oriented. No sooner was he settled in Amboina than he began making a systematic survey of the flora and fauna of the Moluccas, describing carefully everything that lived and grew in his island and the neighbouring ones, collecting as well geographical and mineralogical information, in short preparing, with increasing consciousness, what might be called the Natural History of that region. It is much to the credit of the Dutch authorities that they favored

(5) Amboina or Amboyna is the Malay name internationally used. The Dutch call it Ambon. Position 3°40' S, 128°20' E.

his efforts outside of the commercial field, and allowed him to devote to his hobby more and more time. The governor-general JOAN MAETSUYKER (1608-78, gov. 1653-78) in Batavia, a man of considerable influence who could have harmed as well as helped him, chose the latter course and deserves our gratitude. In 1669, RUMPHIUS was planning to go to Batavia to discuss his work with MAETSUYKER and to arrange for the publication of his writings, but various circumstances obliged him to delay his journey from month to month, and then Fate struck him a second time.

Catastrophe nº 2. — In May 1670, RUMPHIUS lost his sight ! Just try to imagine what such a misfortune, terrible enough for any person, meant for a man who wanted to see everything with his own eyes. However by this time he had acquired so much experience in the accurate description of natural objects that he could guide the efforts of others, and use other eyes than his own for the development of his knowledge. In this eventuality the Dutch Company was generous to him, and permitted him not only to continue in its employ, but to devote much of his energy to science rather than to business. This is the more remarkable because the Dutch Company was as hard — headed a corporation as ever was, for which business and still more business was the supreme rule of life. Much may be forgiven them because of their generous treatment of RUMPHIUS ! Thus the blind man of forty-two now bound to remain in Amboina until the end of his days continued courageously the immense task which he had begun with open eyes and youthful enthusiasm.

Catastrophe nº 3. — However, Fate would not leave him alone, or rather would try his mettle to the limit and thus enable us to see how great he was. In February 17, 1674, an earthquake visited Amboina; RUMPHIUS's wife, Susanna, and his youngest daughter were killed. Still he continued his scientific investigations as well as the fulfilment of his commercial duties.

By that time, RUMPHIUS' main work was already well advanced. That was a herbal of the Moluccan flora, to be published later, much later, under the title of *Herbarium amboinense*. He seems to have begun it as early as 1655. After thirty years of intermittent but perseverant labor he had accumulated splendid collections of drawings and descriptions.

Catastrophe nº 4. — On January 11, 1687, Amboina was almost

completely destroyed by a conflagration. All of RUMPHIUS's drawings (or the drawings made under his direction) were lost, but the manuscript itself was largely saved. The old man continued ! He arranged for the preparation of a new set of drawings. These were made by his son PAULUS AUGUSTUS and other draughtsmen controlled by his good judgment and his vast experience, by all the ingenuity of an eager and resourceful mind.

Catastrophe n° 5. — After five years of labor, the text and abundant illustrations of half the *Herbarium* (books 1 to 6) were finally completed. The manuscript was sent to Holland in 1692 in the ship Waterland, which was sunk by the French — everything on board being lost. Happily before sending the precious manuscript the new governor-general JOANNES CAMPHUYS had caused a copy of it to be made. RUMPHIUS continued his work.

Catastrophe n° 6. — Four more years of labor amidst all the discomforts of tropical life (as hard and cruel as it is glamorous) — far away from every library and university — and the new manuscript of the whole work (12 books) was ready. In 1696, the Heeren ZEVENTIENEN (6) had it in their hands — one of the masterpieces of botanical literature — but they did not consider it worth publishing. It was to remain forty years hidden in their archives.

In the meanwhile the indomitable RUMPHIUS had found the master whom all must obey. Death overtook him in Amboina on June 15, 1702.

At the time of his death he had written at least two capital works, but neither was published. To these works, his main titles to immortal fame, I shall come back presently. When RUMPHIUS died very few people outside of the Dutch Company were aware of their existence, let alone, of their exceptional merit. RUMPHIUS himself however was not unknown. From distant Amboina he corresponded with many scientists of the Indies and of Europe. He made a collection of "rarities" for the cabinet of the Grand Duke of Tuscany, COSIMO III DE' MEDICI (now apparently lost). Best of all, many letters of his were commu-

(6) I quote them after the article in NNBW. I have not been able to find additional information on Messrs. ZEVENTIENEN, but perhaps the best they deserve is oblivion and mercy.

nicated by the German botanist CHRISTIAN MENTZEL (1622-1701) to the *Academia naturae curiosorum* and published in its *Miscellanea curiosa sive Ephemerides* from 1682 to 1698. That *Academia* (the very one which exists to this day under the name of *Kaiserlich-Leopoldinisch-Deutsche Akademie der Naturforscher zu Halle)* had honored itself greatly in 1681 by appointing this unknown Moluccan naturalist to its membership, and calling him *Plinius indicus* (7).

After a long period of oblivion, RUMPHIUS's "*magnum opus*" the *Herbarium amboinense* was rescued from the ZEVENTIENEN archives by the Amsterdam professor JOHANNES BURMAN (1707-79) who decided to edit it, to translate it into Latin, to add various notes, and to publish it with the original illustrations. The work was so enormous and so expensive to produce that no single Dutch firm would assume the whole risk. It was finally issued by a consortium of eight Dutch publishers, in six folio parts appearing in Amsterdam from 1741 to 1750 (8). A new "title edition" of the whole work appeared in 1750. An *Auctuarium* or supplement was published in 1755. The *Herbarium amboinense* was not simply the first herbal of the Moluccas; it was the first large herbal of the eastern and tropical world. And not only that but the descriptions were remarkably accurate and the illustrations splendid. To his careful descriptions of plants and the unequivocal attribution of various traditional names to the described specimens, that is, to the complete identification of the plants, RUMPHIUS added information concerning their habitats and their flowering seasons, and explained how to cultivate them. That information, or at least much of it, is still valuable to-day.

RUMPHIUS' monumental work was not completely given to the world until more than half a century had elapsed since his death. We cannot help feeling, what a pity he could not enjoy a fame so richly deserved, but RUMPHIUS would probably have said that the thing that really mattered to him was not the fame but the deed.

(7) Every member received a nickname at the time of his election, but they were not often as adequate as in this case. See *Isis* 16, 144.

(8) The original MSS. are preserved in the Library of the University of Leiden.

The other great work which we owe to him, the very one which caused a young Yankee to travel to the Far East in the sixties of last century, was revealed much earlier though not early enough to appear within his life-time. I am now referring to his *Amboinsche Rariteitkamer*, the manuscript of which was sent by him in 1701 to his friend Dr. HENDRIK D'ACQUET, burgomaster of Delft. This was a collection of beautiful plates with brief descriptions of the objects illustrated, — mostly shells. Such a book was likely to be appreciated by the collectors of "rarities" and by the other scientific dilettanti, who were surprisingly numerous at that time, in the quiet, prosperous and studious Holland perhaps more than anywhere else. That, and also its smaller size, explains its earlier publication in 1705, (9) — that is, half a century before the herbal, though the manuscript of it reached Europe many years later. It is one of the classics in the history of malacology.

RUMPHIUS is one of the great naturalists of the seventeenth century and indeed of all times. In addition to that, he was a man of heroic size — and it is for that reason above all others that I love him and celebrate him. He deserves to be better known especially to young naturalists, and I hope that an elaborate biography of his may soon become available to them.

S. S. Excalibur GEORGE SARTON

(June 13, 1936 off the Azores on the way from New York to Marseilles).

Bibliography

In 1902, the Colonial Museum of Haarlem commetated the second centenary of RUMPHIUS' death and published on that occasion in the Dutch language a memorial book which is the main source of information available to-day.

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(9) A Latin edition, *Thesaurus imaginum piscium testaceorum*, etc. including the same plates, was published in Leiden 1711. There are various other editions in Dutch, Latin, and German.

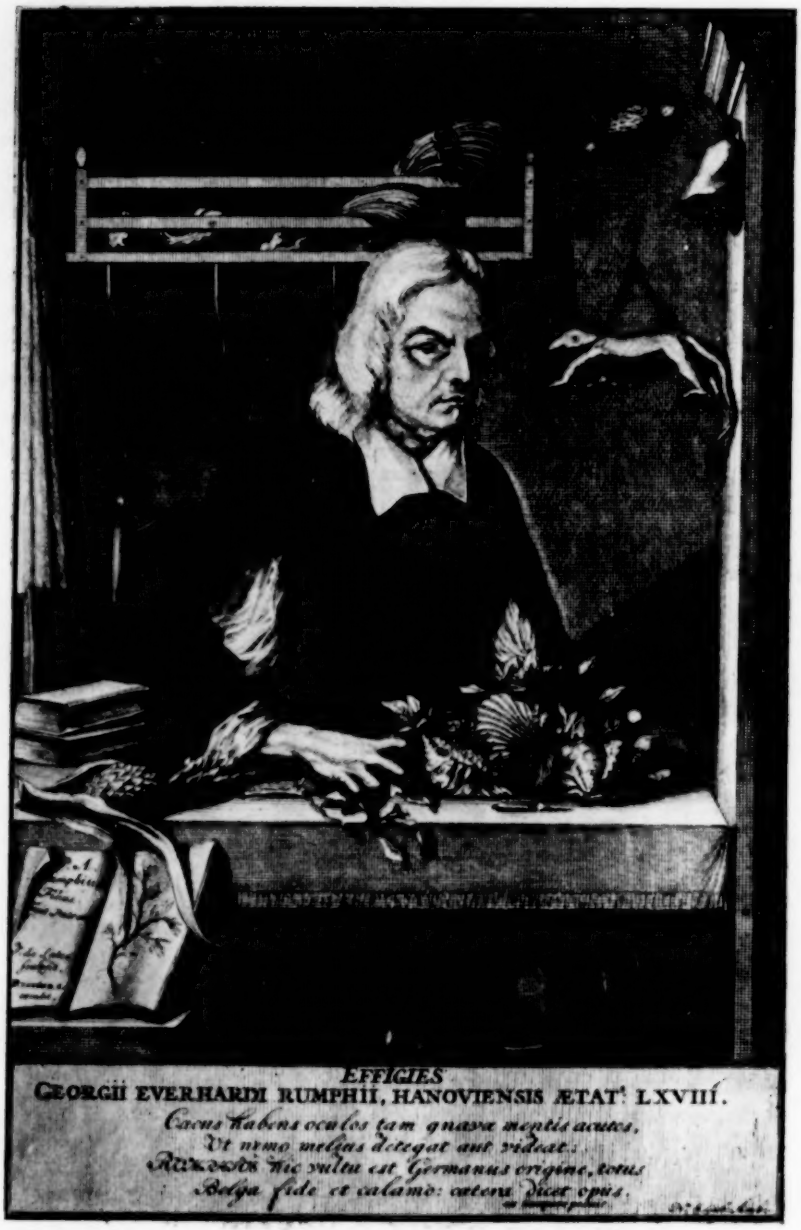
EFFIGIES
GEORGII EVERHARDI RUMPHII, HANOVIENSIS ÆTAT. LXVIII.
Cæcus habens oculos tam gnaræ mentis acutos,
Ut nemo melius detegat aut videat:
Hic vultu est Germanus origine, totus
Belga fide et calamo: cætera dicet opus.

FIG. 1. Portrait of RUMPHIUS in 1696 (Aet. 68).

Waerachtigh Verhael,

Van de

Schrickelijcke Aerdbevinge /

Nu onlanghs eenigen tyd herwaerts, ende voornaementlijck op den 17. February des Jaers 1674. voorgevallen,

In / en ontrent de Eylanden van

AMBOINA,

Mitsgaders

Ongehoorde Watervloeden, droevige ongelucken, en wonderlijcke by-sonderheden, &c. daer op gevolght, gelijck sulcx in het Dagh-Register van dien, neerstigh en omstansligh aengeteyckent staet, en uytgetrocken is,

Als mede

Autentycque Extracten van Brieven over het selve. Alles met het laetste Schip de Vrye-zee bericht / en behoorlijck gemarcht.

Gedruckt naer de Copye van BATAVIA, In't Jaer Onses Heeren, 1675.

FIG. 2. RUMPHIUS' account of the earthquake of Amboina 1674.

candorem obtestor, ne mihi succenseas, si jam de hisce parvitatem meam intellexeris: humanitate enim tua prolectus amplius te latere nolo: *Germanus sum*, nec inclyto illi Hagensi Rumphio Domini Principis Auriaci Archiatro ullâ (quantum sciam) cognitione junctus; *natus in Comitatu* Solmensi: *educatus Hanoviæ*, ubi Parens meus Augustus Rumphius Architectum egit ante Annum 1666. Ego vero insatiabili rerum peregrinarum cognoscendarum desiderio flagrans maturè Patriam reliqui: primò in Portugalliam delatus, deinde post triennium redux ante 28. abhinc annos in Indiam Orientalem me contuli, & fatò in ultimas versus Ortum Insulas ductus *Amboinæ hæreo*, senectuti jam propinquus. Statim sub meum in Indiam ingressum conscribere cœpi Historico quidem, attamen methodico stylo rariores harum Insularum *stirpes, animantia, marina, mineralia &c.* quæ sese oculis meis obtulerunt, & quantum de eorum viribus ex incolis indagare potui, adjectis (quantum artis in me erat) plerisque *figuris*, idque Latino sermone. Processerat rude chaos in aliquam molem, cùm divina voluntas, absque dubio, meæ saluti, quàm ego, plus consu'ens, totum mundum cum omnibus creaturis subitò meo visui subtraxit, unde jam per decennium *in tristibus tenebris sedere cogor: Catarrhactæ* nigra oculos meos invadens id effecit: noluerunt tamen Domini mei Superiores schedulas meas perire; sed subinde Amanuensem unum atque alterum mihi adjunxerunt: horum operâ prædictum chaos in ordinem dirigere & certò consilio è Latina in vulgarem Belgicam linguam transferre aggressus sum, cum non exiguo prioris nitoris & doctrinæ detrimento, prout talia scripta succedunt, quæ mutuatitiis oculis manibusque componuntur. Plantis decem destinavi libros, quorum jam septem ferè absolvi, & (si Deus vitam mihi protraxerit) alios quinque addere animus est de præcipuis *animantibus* tam terrestribus, quàm aquatilibus, cochleis & lithodendris marinis paucisque mineralibus. Habes jam, Vir honoratiss. Rumphium illum Indicum, quantulus

FIG. 3. RUMPHIUS' autobiography written c. 1680. (see note at the end of SARTON's article)

HERBARIUM AMBOINENSE,

Plurimas complectens Arbores, Frutices, Herbas, Plantas terrestres & aquaticas,

QUAE IN AMBOINA,

ET ADJACENTIBUS REPERIUNTUR INSULIS,

Accuratissime descriptas juxta earum formas, cum diversis denominationibus, cultura, usu, ac viribus.

Quod & insuper exhibet

VARIA INSECTORUM ANIMALIUMQUE GENERA,

Plurima cum naturalibus eorum figuris depicta.

Omnia magno labore ac studio multos per annos conlegit, & duodecim libris Belgice conscripsit

GEORG. EVERHARD. RUMPHIUS,

Med. Doct. Hanoverensis, Mercator Senior, & in Amboina Consul, vernac. PLINII INDICI *cognom. & Insignis Societatis Academiae Naturae Curiosorum Germaniae Membrum.*

Nunc primum in lucem editus, & in Latinum sermonem versus

JOANNES BURMANNUS,

MED. DOCT. ET IN HORTO MEDICO AMSTELAEDAMENSI PROFESSOR BOTANICUS, ACADEMIAE CAESAREAE NATURAE CURIOSORUM SOCIUS.

Qui varia adjecit Synonyma, suasque Observationes.

PARS PRIMA.

AMSTELAEDAMI, { Apud Franciscum Changuion, Joannem Catuffe, Hermannum Uytwerf

HAGAE COMITIS, { Apud Petrum Gosse, Joannem Neaulme, Adrianum Moetjens, Antonium van Dole.

ULTRAJECTI, Apud Stephanum Neaulme.

M. DCC. XLI

FIG. 4

GEORGII EVERHARDI RUMPHII,

Med. Doct. Hanoverensis, Mercatoris Senioris, & in Amboina Consulis, vernace PLINII INDICI *celebris, & Membri Illustris Societatis Academiae Naturae Curiosorum Germaniae,*

HERBARII AMBOINENSIS AUCTUARIUM,

Reliquas complectens Arbores, Frutices, ac Plantas,

QUAE IN AMBOINA,

ET ADJACENTIBUS DEMUM REPERTAE SUNT INSULIS.

Omnes accuratissime descriptae, & delineatae juxta earum formas, cum diversis Indicis denominationibus, cultura, usu, ac viribus;

Nunc primum in lucem editum, & in Latinum sermonem versum,

Cura & Studio

JOANNIS BURMANNI,

Med. Doct. Illustris Athenaei, & Horti Medici Amstelaedamensis Professoris Botanici,

Academiae Caesareae Naturae curiosorum Socii.

Qui varia adjecit Synonyma, suasque Observationes.

AMSTELÆDAMI,

Apud { MYNARDUM UYTWERF, & Viduam ac Filium S. SCHOUTEN,

M DCC LV.

FIG. 5

FIG. 4

D'AMBOINSCHE RARITEITKAMER,

Behelzende eene BESCHRYVINGE van allerhande zoo weeke als harde

SCHAALVISSCHEN,

te weeten raare

KRABBEN, KREEFTEN,

en diergelyke Zeedieren,

als mede allerhande

HOORNTJES en SCHULPEN,

die men in d'Amboinsche Zee vindt:

Daar beneven zommige

MINERAALEN, GESTEENTEN,

en soorten van AARDE, die in d'Amboinsche, en zommige omleggende Eilanden gevonden worden.

Verdeelt in drie Boeken,

En met nodige PRINTVERBEELDINGEN, alle naar 't leven getekent, voorsien.

Beschreven door

GEORGIUS EVERHARDUS RUMPHIUS,

van Hanaue Koopman en Raad in Amboina, mitsgaders Lid in d' *Academie Curieuse der Natuur*, in 't Duitsche Roomsche Ryk opgerecht, onder den naam van

PLINIUS INDICUS.

TAMSTERDAM,

Gedrukt by FRANCOIS HALMA, Boekverkoper in Konstantyn den Grooten.

1705

FIG. 6

THESAURUS IMAGINUM PISCIUM TESTACEORUM;

Quæ sunt

Cancri Echini Echinometra Stellæ Marinæ &c

Ut &

COCHLEARUM,

Inter quas numerantur

Lampres, Lauiata, Triulo, Volutæ, sive Semilunares, Volutæ ſtriatæ, Colubri tubuloſi verruculoſi, Ireos & Murices, Globoſæ, Buccina, Strombi, Volutæ Alatæ Porcellanæ magnæ & minores Cylindri, &c

Quibus accedunt

CONCHYLIA,

Ut

Nautili, Cornu Ammonis, &c

CONCHÆ UNIVALVIÆ & BIVALVIÆ;

Quarum ſpecies ſunt

Solenes univalves, Chamæ aſperæ, Chamæ leves, Pectines, Pectunculi, Tellinæ, Solenes bivalves, Muſculi, Pinnæ, Oſtreæ, &c

Denique

MINERALIA,

Ut

Metalla, Lapides & Argilla, varia in locis reperta

Quorum omnium maximum parem

GEORGIUS EVERHARDUS RUMPHIUS M. D.

Et *Academiæ Cæſareæ Naturæ Curioſorum Collega*, dictus PLINIUS INDICUS, collegit

Jam vero Naturæ Amatoribus & Curioſis quibuſdam in hoc ordinem digeſſit & notabiliſſimè illuſtravit

LUGDUNI BATAVORUM,

Apud PETRUM vander Aa, Bibliopolam. M D CC XI.

FIG. 7

FIG. 8

LE COLLEZIONI

DI

GIORGIO EVERARDO RUMPF

acquistate dal Granduca Cosimo III de' Medici

UNA VOLTA ESISTENTI NEL

MUSEO DI FISICA E STORIA NATURALE DI FIRENZE

ESTRATTO DA UN CATALOGO MANOSCRITTO

dal Prof. GIOVANNI TARGIONI-TOZZETTI

PER CURA DI UGOLINO MARTELLI

Professore pareggiato nella R. Università di Pisa

FIRENZE
TIPOGRAFIA LUIGI NICCOLAI
—
1903

FIG. 9. Florence 1903.

Rumphius Gedenkboek, 1702-1902. Uitgegeven door het Koloniaal Museum te Haarlem, 15 Juni 1902 (folio viii-222 p., illus.).

This contains a series of studies on his biography (by J. E. HEERES), on his work as a historiographer, botanist, zoologist, mineralogist, etc., and a very elaborate bibliography by G. P. ROUFFAER and W. C. MULLER (56 p.). Indeed that bibliography is so complete that it would seem almost impossible to improve upon it except by the suppression of many futilities. The *Gedenkboek* is the foundation for a complete biography of RUMPHIUS, a biography which is still unwritten.

See also J. SIRKS's short notice in the *Nieuw nederlandsch biografisch woordenboek* (vol. 3, 1104-07, 1914).

Notes on the Illustrations

FIG. 1 — This portrait of RUMPHIUS occurs in all the Dutch and Latin editions of the *Rariteitkamer* (1705, etc). We reproduced it from the *Thesaurus*, 1711 (see title page below). For other portraits see *Rumphius-Gedenkboek* (1902, p. 218-19).

FIG. 2 — *Waerachtigh Verhael*, 1675. RUMPHIUS' account of the earthquake which occurred in Amboina, on Feb. 17, 1674. This printed text was poorly edited on the basis of RUMPHIUS' notes. See *Gedenkboek* (p. 173). The first line measures about 10 cm.

FIG. 3 — RUMPHIUS' autobiography written in answer to a request received in a letter from CHRISTIAN MENTZEL, Berlin, Oct. 2, 1678. It was published in the *Miscellanea Curiosa sive Ephemerides medico-Physicarum Germanicarum Academiae Naturæ Curiosorum* (Decuriae II Annus 1, 1682, Norimbergae, 1683). See *Gedenkboek* (p. 174). RUMPHIUS' article begins :

"Observatio XXI. Dn. GEORGII EVERHARDI RUMPHII. De Caryophyllis aromaticis. Quôd vel fama fallax more suo agens, vel amici cujusdam (forsitan Domini CLEYERI) indulgentiores literae me majorem, quam sum, apud te depinxerint, Vir Clariss. ex honoratis

FIG. 9. Florence 1903.

FIG. 8

tuis 2. Octobris Anni 1678, Berolinô ad me datis, conjecturam facio : quapropter animi tui candorem..."

Then follows the page reproduced in our fig. 3, the last sentence of which ends (p. 52) : "quantulus est, et quid studiorum satagat." The text of that "*observatio de caryophillis*" continues to the middle of p. 53, and there is one plate of illustrations. The lines are 11.5 cm. long.

FIG. 4 — First edition of the *Herbarium amboinense*, vol. 1, Amsterdam 1741. Completed in six folio volumes (Amsterdam 1741-50). The word *Herbarium* is 143 mm. long.

FIG. 5 — Supplement to the *Herbarium*, forming volume 7 and last of the whole work (Amsterdam 1755). The first line (the author's name) is 164 mm. long.

FIG. 6 — First edition of RUMPHIUS' first book to be printed, the *Rariteitkamer* (chamber of rarities), which appeared in Amsterdam 1705, three years after his death. The first line measures 10 cm.

FIG. 7 — First edition of the Latin translation of the same work, Leiden 1711. The first line *(Thesaurus)* measures 88 mm.

FIG. 8 — Secondary title page of the *Thesaurus* of 1711. The frame of the picture is 113 mm. wide.

FIG. 9 — Catalogue of the collections of natural objects made by RUMPHIUS and sold by him to the Grand duke COSIMO III DE' MEDICI in 1682. It is a book of 213 p., the first line of the title page *(Le collezioni)* measures 52 mm.

The orignal Ms. catalogue was entitled : " Catalogo delle produzioni naturali che si conservano nella Galleria Imperiale di Firenze, disteso nell'anno 1763 per ordine di S.E. il Maresciallo ANTONIOTTO BOTTA ADORNO dal prof. GIOVANNI TARGIONI-TOZZETTI." That original Ms. is lost, and MARTELLI's publication (Florence 1903) was made not from that Ms. but from a Ms. copy made c. 1870 and kept in Florence.

In 1778, the objects catalogued by TARGIONI-TOZZETTI were still in existence, but since then they have disappeared. Said MARTELLI in his book of 1903 "ma oggi di quasi tutti quelli di RUMPF, è doloroso a dirsi, più nulla sembra esistere."

We owe figs. 1, 6, 7, 8 to the courtesy of the Harvard Library; fig. 2 to the courtesy of the Colonial Library in The Hague; fig. 3 to the courtesy of the University Library of Toronto; figs. 4 and 5 to the courtesy of the Library of Congress and Mr. F. E. BRASCH; fig. 9 to the courtesy of the British Museum. All these courtesies are gratefully acknowledged.

Newton's Third Law of Motion

While analyzing a new textbook (1) on physics, the writer was led to examine NEWTON's discussion of the third Law of Motion in the "Principia." This investigation revealed an ambiguity in NEWTON's account which appears to have been overlooked by commentators.

The third Law states (2), "To every action there is always opposed an equal reaction; or, the mutual actions of two bodies upon each other are always equal, and directed to contrary parts." In illustration, "Whatever draws or presses another is as much drawn or pressed by that other. If you press a stone with your finger, the finger is also pressed by the stone." NEWTON's statement of the law and his illustrations suggest that action and reaction act on different bodies. If the finger presses a stone, the stone exerts an equal and opposite force, the reaction, on the finger. This generally accepted interpretation of the third Law is confirmed in the first part of the scholium which concludes the account of the laws of motion. In the first part NEWTON describes experiments on the impact of bodies in which action and reaction act on different bodies. He also presents arguments to prove that the third Law applies to attractions. Continuing the discussion of the third Law he says, "And as those bodies are equipollent in the impact and reflection, whose velocities are inversely as their innate forces, so in the use of mechanic instruments those agents are equipollent, and mutually sustain each the contrary pressure of the other, whose velocities, estimated according to the determination of the forces, are inversely as the forces. So those weights are of equal force to move the arms of a balance,

(1) MILLIKAN, ROLLER, WATSON : Mechanics, Molecular Physics, Heat, and Sound. Boston. GINN and Company, 1937. (*Isis*, 27).

(2) NEWTON's *Principia*, A revision of MOTTE's translation by F. CAJORI. Berkeley, University of California Press, 1934. p. 13.

which during the play of the balance are inversely as their velocities upwards and downwards; that is, if the ascent or descent is direct, those weights are of equal force, which are inversely as the distances of the points at which they are suspended from the axis of the balance."

The foregoing quotation expresses a second concept of action and reaction. The two bodies, which are suspended from the arms of the balance, exert forces on the same body and therefore are not action and reaction as previously defined. If body A exerts a force on the balance, the reaction to it is the force that the balance exerts on A; similarly for the body at the other end of the balance. The forces acting on the balance may be called applied force and resistance. This language is employed by NEWTON. " The power and use of machines consist only in this, that by diminishing the velocity we may augment the force, and the contrary; from whence, in all sorts of proper machines, we have the solution of this problem : To move a weight with a given power, or with a given force to overcome any given resistance." After discussing such examples he concludes, " I was aiming only to show by those examples the great extent and certainty of the third Law of motion."

In order to make NEWTON's account of the third Law self-consistent it is necessary to assume that he used action and reaction in two senses : as force and counter-force which act on different bodies, and as applied force and resistance which act on the same body.

The two-fold meaning of action and reaction is exhibited in some commentaries. Thus L. BLOCH writes (3), " L'existence des forces de réaction se constate non seulement dans le cas de la dynamique, mais encore dans le cas de la statique. Si par exemple le doigt presse la pierre, la pierre exerce en même temps sur le doigt une pression égale et de signe contraire. Tout corps qui en tire un autre est en même temps tiré par cet autre... Dans tous les cas de ce genre, il y a équilibre de forces." In the examples which the author cites from NEWTON, action and reaction act on different bodies, whereas equilibrium requires equal and opposite forces which act on the same body. Thus

(3) L. BLOCH : La Philosophie de Newton. Paris, 1908. p. 222.

the author confuses counter-force and resistance. Again he says (4), " La plupart du temps les réactions nous intéressent assez peu. Nous tenons surtout à connaître les forces que nous dépensons et les effets qu'elles produisent, mais le méchanisme des réactions intermédiaires nous est indifférent. Ainsi lorsqu'un solide repose en équilibre sur un plan incliné, nous tenons à savoir la relation qui existe entre son poids, sa forme, et l'angle que peut atteindre son inclinaison avant qu'il y ait glissement. Mais la mesure des forces de frottement qui s'exercent entre le corps et le plan n'a pour nous que peu d'importance." In this passage the author uses reaction in the sense of resistance which acts on the same body as the action. THOMSON and TAIT (5) introduce the third Law with a statement and examples which imply that action and reaction act on different bodies. But in their subsequent discussion they employ the principle that the Counter-activity of the resistance is equal and opposite to the Activity of the agent. Since the resistance acts on the same body as the agent, these authors contribute to the ambiguity in the concept of reaction.

Contemporary writers on mechanics usually state explicitly that action and reaction act on different bodies. Some of the writers who accept this restricted meaning of action and reaction also explain equilibrium in terms of the third Law. They thereby confuse reaction and resistance. A balance is in equilibrium if the moment of the applied force is equal and opposite to the moment of the resistance. Both moments act on the balance and it is incorrect to derive their equality from a third Law which assumes that action and reaction act on different bodies.

The writer thinks that the third Law should be restricted to forces that act on different bodies, and that equilibrium should be treated as a special case of the second Law.

University of California. V. F. LENZEN.
Berkeley, California.

(4) *Ibid.*, p. 226.

(5) THOMSON and TAIT : Treatise on Natural Philosophy. Cambridge, 1879. vol. I, part I, p. 247.

Bishop John Wilkins and the Definition of Science

Among the various phenomena connected with the development and spread of new devices and new conceptions, one of the most interesting is the effort of man to obtain words which will properly describe and identify them. In England the scientific renaissance which flowered in the seventeenth century was first described by bringing together the word *new* and the word *philosophy*, and for many years after GALILEO and the telescope the science and scientific inquiry which characterized this renaissance was known as the *new philosophy*. During these years, however, the word *science* was gradually acquiring those interpretations commonly employed today, and the defining adjective *natural* was not infrequently placed before it. In the *Oxford English Dictionary*, the most helpful of all compilations which attempt to date the genesis of words and new interpretations, the earliest examples of the three new meanings which the old word *science* gradually assumed are from the years 1725, 1651, and 1867. These dates are quite too late, for two of these interpretations had formed and the third was well developed in 1640.

The *Oxford English Dictionary* says in explaining and illustrating its fourth definition of the word *science :*

> In a more restricted sense : a branch of study which is concerned either with a connected body of demonstrated truths or with observed facts systematically classified and more or less colligated by being brought under general laws, and which includes trustworthy methods for the discovery of new truth within its own domain. 1725, WATTS *Logic*, II, ii, s. 9. The word science, is usually applied to a whole body of regular or methodical observations or propositions, ...concerning any subject of speculation... 1794, HUTTON, *Philosophy Light, etc.* 117, Philosophy must proceed in generalizing those truths which are the objects of particular sciences.

Eighty-five years before WATTS, Bishop WILKINS presented in his discussion of the value of Astronomy a definition of *science*

much nearer that of the *OED* than is the example quoted from the *Logic* of WATTS :

> Consider it as such a particular *Science*, *Astronomy* : the Word signifies the Law of the Stars... The excellencie of any *Science* may be judged of... Secondly, by the certaintie of it's demonstrations... For the *demonstrations* of *Astronomy*, they are as infallible as truth it self; and for this reason also do's it excel all other knowledge, which do's more depend upon conjectures & uncertaintie. They are onely those who want skill in the Principles of this *Science*, that mistrust the conclusions of it... In the great *Vniverse*... the common apprehension of things is not at all considerable, in comparison to those other discoveries, which may bee found out by a more exact enquiry (1).

The next and fifth definition of *science* is given and illustrated in this fashion :

> The kind of knowledge or of intellectual activity of which the various 'sciences' are examples.. In modern use chiefly : the sciences (in sense 4) as distinguished from other departments of learning; scientific doctrine or investigation. Often with defining adjective, as in 4b. 1651. HOBBES, *Leviathan*, II, xxxi, 191, The principles of naturall Science...

In the statement first quoted from Bishop WILKINS, he spoke of the " Principles of this *Science* ", and on the page preceding that of this statement, said of Astronomy : " Now this of all other naturall *Sciences* may best of all challenge our Industry " (2). Again, there is no interpretation of science in the quoted example which is not present in the description of Bishop WILKINS.

The third and last of the three new definitions acquired by *science*, given and illustrated by the *Oxford Dictionary* under *5b*, is perhaps more implied than definitely expressed by the Bishop, but comparison of both definition and illustration with two of his statements is not unfruitful :

> In modern use, often treated as synonymous with 'Natural and Physical Science', and thus restricted to those branches of study that relate to the phenomena of the material universe and their laws, sometimes with implied exclusion of pure mathematics... 1867. W. G. WARD, in *Dublin Review*, April, 255 *note*, We shall... use the word 'science' in the sense which Englishmen so commonly give to it; as expressing physical and experimental science, to the exclusion of theological and metaphysical.
>
> (*a*) Consider it [Astronomy] as a *Science*... So much happinesse could hee

(1) *A Discourse Concerning a new Planet*, London, 1640, pp. 235-7, 240.
(2) *Ibid.*, pp. 236-7. The word *other* (of all *other* naturall *Sciences*) is added in the *errata*.

[SENECA] discerne in the Studies of Nature. And therefore as a *Science* in generall, it may very well deserve our Love and Industry (3). (*b*) The excellencie of any *Science* may be judged of... first, by the excellency of the Object... The *Object*... is no lesse than the whole World (since our Earth also is one of the Planets) more especially those vast and glorious Bodies of the Heavens. So that in this respect, it far exceeds all those barren, empty speculations, about *Materia prima*, and *Vniversale*, and such like cob webs of learning; in the study of which, so many doe misplace their younger yeares. And for the same reason likewise is it to be preferr'd before all those other *Sciences*, whose subjects are not either of so wide an extent or so excellent a Nature. (4)

In the first of the two examples cited from Bishop WILKINS, " Studies of Nature " are described as synonymous with " *Science* in generall," and in the second, the several sciences, including the particular science of Astronomy, are contrasted with metaphysics.

It is apparent that JOHN WILKINS, leader in the Invisible College at Oxford, one of the two first secretaries of the Royal Society, and devoted friend of *science*, employed this word in 1640 with three meanings not given in the *Oxford English Dictionary* earlier than 1725, 1651, and 1867. In addition to being inaccurate as to the time when the three new interpretations were used in print, the first and last of these dates convey no suggestion of the surging rise of science and scientific inquiry during the seventeenth century. The next edition of the invaluable *Dictionary* would do well to consult the writings of Bishop WILKINS and those of his friends in the Royal Society when illustrating the several definitions of modern civilization's most important word.

Smith College. GRANT MCCOLLEY

(3) *Ibid.*, pp. 234-5.
(4) *Ibid.*, p. 236.

Count Rumford, a youthful meteorologist

The first recorded scientific observations of BENJAMIN THOMPSON, Count RUMFORD, are contained in a letter recently discovered in the archives of the American Philosophical Society in Philadelphia.

During research in preparation for a biography of Count RUMFORD, in which the authors are collaborating, a hitherto unpublished communication of April 3, 1773 was found, entitled;

„ An account of an *AURORA BOREALIS* observed at *BRADFORD* in *NEW ENGLAND*, by *BENJAMIN THOMPSON* of *CONCORD* in New Hampshire, and of a remarkable *CHILD* born at WOBURN N. E. April 1772, with an excellent Drawing of the same. "

From his early youth, BENJAMIN THOMPSON was interested in all branches of Natural Philosophy, not excluding Astronomy and Meteorology. At eleven, having made a start in mathematics, he began his celestial studies. When twelve years of age, he lived for a time in the family of the Reverend SAMUEL WILLIAMS of Bradford on the Merrimac. This divine was an ardent scientist, and greatly stimulated BEN's philosophical inclinations. While a merchant's apprentice in Salem, the boy continued his studies with the Minister of the First Church, the Reverend THOMAS BARNARD. „ Before the age of fourteen ", RUMFORD later wrote, „ I had made sufficient progress to be able without his aid, and even without his knowledge, to calculate and plot the elements of a solar eclipse. We observed it together, and my computation was correct within four seconds. "

When BENJAMIN was nineteen he was called to Bradford as schoolmaster, and while there made his observations on the aurora borealis. That he should send them to the American Philosophical Society was natural enough, for his mentor, the Reverend WILLIAMS, had just been honored by election to that learned body. Years later (Feb. 1803) after attaining distinction as British Under-Se-

cretary, Bavarian General, philantropist, and founder of the Royal Institution of Great Britain, Count RUMFORD then a resident of Paris, was himself elected to membership in the American Philosophical Society.

Neither the account nor the „ excellent drawing " of the remarkable Woburn child is to be found in the library of the Philosophical Society but it was no doubt the same malformed infant that is perpetuated by the drawing and full description in THOMPSON's notebook now preserved at Concord, New Hampshire.

The communication reads as follows :

On Saturday evening July 25th, 1772 (the weather being uncommonly calm and serene) at 8h 30' there appeared a small dark cloud laying along the horizon from N to NE, from behind which proceeded a faint whitish light, frequently darting forth lucid streams in various directions. These appearances were increasing 'till 9h 30' when the dark basis of this meteor having advanced to about 10° above the horizon, and its uper edge having form'd itself, into an arch of a circle, the light began to be much more intense, frequently breaking forth into the most beautiful coruscations.

At 9h 45' There proceeded a great number of luminous streams from the convex or upper edge of the cloud, which mounting very swiftly upwards into Zenith soon vanished.

At 10h 5 there appeared a most beautiful bow of light about twice the breadth of a common rain-bow, extending from 60° E to about as many W of the northern point of the horizon. The highest part of this luminous arch was about 8° above the polar star; both its edges were extremely well defined, and every part of it was equally splendid. At the same time a vast number of exceeding bright beams, in the form of pyramids proceeding from behind the dark cloud, passed upward, towards the luminous bow. By the direction of these rays they seemed to be rather proceeding from one common centre, which centre might be 10 or 15° below the horizon.

At 10h 15' The pyramidal striae that were between the bow and the cloud vanished, and others appeared shooting upwards from the internal circumference of this lucid arch to the distance of 30°. : the whole appearing splendid beyond conception. After remaining in this situation 5 or 6 Minutes these streams of light

began to move along the heavens from E to W, keeping their form, and their situation with respect to each other very exactly. And as they pass'd from the E there appeared others 'rising from the horizon, as if the whole great circle of light, of which this bow was a part, was revolving about its centre, and shewing us alternately different parts of its circumference. This motion continued for the space of 5 or 6 minutes, After which it began gradually to decrease, and the light began to be much more languid, 'till at 10h 25' there was nothing remaining of this beautiful phenomenon but a faint track thro' the heavens where the bow was situated, and a uniform lightness above the dark cloud in the N resembling a bright crepusculum.

At 10h 31' two remarkable streams made their appearance in the W N W shooting upwards to the height of 45°, greatly surpassing in lustre and magnitude any that had hitherto appeared. The form of these streams was very changeable, frequently uniting into one great luminous pyramid, and again seperating into 2 and sometimes into 3 smaller ones of the same altitude; 'till 11h when they entirely disappeared.

At 11h 3' two luminous arches appeared over the dark cloud which still lay in the N; the one situated about 15° and the other about 20° above the horizon. But neither of these bows were any thing near equal to that which appeared at 10h 15' either in magnitude, brightness, or the regularity of its form. During the appearance of these luminous fasciae, there were frequently seen small undulating clouds roling along the heavens from E to W in the same track in which the first great lucid bow appeared. The cloud seem'd much brightest when directly in the Zenith, but vanish'd insensibly as they approached the Western part of the horizon.

At 11h 20', pyramidal radiations shot forth swiftly from behind the cloud in the N, which mounting up towards the Zenith, resembled very exactly the appearance at 9h 30'.

From this time (11h 20') 'till midnight the appearance of the meteor was very Mutable; being sometimes scarse perceptible, and at others filling almost the whole northern hemisphere with the most beautiful coruscations.

From midnight 'till 1 OClock the Meteor seem'd to be gradually dying away, at which time I left of observing.

This paper is published with the consent and approval of the American Philosophical Society, to whom we wish to express our thanks for their courtesies.

Evanston, Ill.

LUCIA M. H. LOWRY
C. D. LOWRY, Jr.
JOHN RICE MINER

The graveyard fort; a disputed incident in the life of Count Rumford

The Summer of 1782 found twenty-nine year old Lieutenant-Colonel BENJAMIN THOMPSON (1), American-born Commander of British Cavalry, later to achieve fame as Count RUMFORD, on Long Island, busily seeking " likely Spirited Young Lads " who preferred " riding on horseback to going on foot " as recruits for the King's American Dragoons, a Loyalist regiment (2).

Tempting bonuses offered by Colonel THOMPSON brought men flocking to him, among whom were to be found some deserters from the American forces, and his Corps soon attained its prescribed strength. Thanks to the Colonel's varied experiences in supplying equipment to the British forces in America while Under-secretary of State in the Colonial office, he was able to report that the accoutrements of the Regiment were " not only more complete " than those of any other Regiment of Cavalry in His Majesty's Service, " but at the same time cost less money " (3). As a matter of fact, he enthusiastically declared, " not a single Article is wanting to complete the Regiment... either as a Regiment of Cavalry, or dismounted as a Battalion of Light Infantry, Carbines and Pistols, and Camp equipage only excepted." Much of the expense of preparation the zealous Colonel defrayed out of his own pocket, and " to keep the Arms and Appointments in proper order and condition," he had

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(1) Born Woburn, Mass., March 26, 1753. Became Count RUMFORD by the authority vested in CARL THEODORE, Elector of Bavaria, as Vicar of the Holy Roman Empire in 1792.

(2) *Rivington's Royal Gazette*, July 24, 1782.

(3) H. O. Dom Geo III 42-3 in Public Records Office, London. "A Short Account of the King's American Dragoons, with Authentic Copies of all the Papers relative to the raising of that Regiment," presented to Sir GUY CARLETON by BENJAMIN THOMPSON.

" brought with him one of the best Armourers, and one of the best Sadlers that could be procured in London."

The Regiment, mustered on August the first at Flushing, was presented with its colors by the eighteen-year old Prince WILLIAM HENRY (afterwards King WILLIAM IV), the only member of the British Royal Family to visit America during the entire Colonial period. Resplendent in brilliant uniforms, the royal party inspected the four troops of the Regiment and " with his own hand " the Prince presented the colors to Lieutenant-Colonel THOMPSON. " Upon a signal the whole regiment and all the numerous spectators gave three shouts; the trumpets sounded; the music played *God Save the King*; the artillery fired a royal salute; and the ceremony was concluded " (4).

After the ceremony the Regiment gave themselves over to a celebration, which included a barbecue. " An ox was roasted whole, spitted on a hickory sapling, twelve feet long, supported on crotches, and turned by handspikes. An attendant dipped a swab in a tub of salt and water to baste the ox and moderate the fire. Each soldier then sliced off for himself a piece of the ill-cooked beef."

The appearance of the King's American Dragoons on this occasion delighted Colonel THOMPSON. " I suppose," he wrote to his patron, Viscount SACKVILLE (formerly Lord GEORGE GERMAIN), " a finer body of men never were seen in the world; ... I will venture to say that ours is now the crack corps in this Army... I should not be ashamed to show the regiment in Hyde Park... His Royal Highness (Prince WILLIAM HENRY) said the other day at the Admiral's (DIGBY) table that he might easily have mistaken us for an Established British Regiment of Light Dragoons " (5).

The degree of excellence displayed by the new troops was directly attributable to the indefatigable application of the young commander, whose associates feared that he would ruin his health by his intense devotion to duty and the incessant fatigue of army life. Constantly exposed to the fevers ever prevalent in eighteenth

(4) *Rivington's Royal Gazette*, Aug. 7, 1782.

(5) THOMPSON to SACKVILLE (Lord GEORGE GERMAIN) Aug. 6, 1782 in SACKVILLE papers in the Private Collection of the late WILLIAM L. CLEMENTS of Bay City, Michigan.

century military camps, Colonel THOMPSON was nevertheless able to report, " I escape wonderfully—everybody tells me I cannot go on except I drink wine—... I drink Water not with standing, & take as much exercise both of body and Mind as would kill a dozen Lazy Wine bibbers that preach to me, and often laugh at them while they are quivering and Shaking with Ague... I have yet escaped that most dreadful of all disorders : Tho I dont drink one drop of Wine of any kind—I drink Water, mixed with a little Brandy or Rum, and am very careful not to overload my Stomach " (6).

" Till within these three days," he confided to his patron, " I have not been absent 24 Hours from my regiment these three months—I not only order, but see everything done... What is very singular, since I first joined the Regiment there has not been a Desertion when I was actually Present." " More attention never was paid to any Corps," he asserted, " and I have every day the pleasure of seeing My labours amply rewarded... Tho the Regiment has been raised in the midst of an army by no means famous for its discipline the Men are really very Orderly, and I have scarcely had a Complaint from an Inhabitant of any depredation Committed by them. There is not a district we have been in where the People have not expressed their regret when we left them, so great they say is the difference between us and the Troops they commonly have among them."

That there were so few desertions was due, in large part, to the humanitarian treatment accorded by THOMPSON to his subordinates. In this, his first experience as a commander of troops, he showed that enlightened point of view which he was later to manifest in Bavaria, where he strove to create as democratic an army as was possible in an absolute monarchy—an army in which " citizens were soldiers and soldiers citizens." " We all live together in a regimental mess," wrote young Colonel THOMPSON. " I Permit no man to be taken from the Ranks to be made a Servant of—All our Officers have Black Servants who get no pay from the King."

But according to a story which gained wide credence in America at this time, and which persisted even long enough to be retold

(6) Id. to id. Aug. 8, 1782, *Op. cit.*

in a French journal twenty years later, kindness alone was not sufficient entirely to prevent desertion and Colonel THOMPSON, so the story ran, was forced to use more drastic means (7).

He announced that deserters apprehended would at once be shot and their bodies carried along with the regiment in small carts, which he had conspicuously placarded " To Carry the Bodies of Deserters." The presence of these carts and the gruesome possibility thus suggested that they might be carried in them, instead of marching, affected the imagination of the soldiers and proved an effective deterrent to desertion.

Although Colonel THOMPSON revelled in the command of cavalry, his favorite branch of the military service was always the artillery. Apparently it appealed to his restless scientific spirit. He had conducted experiments with the guns of the Channel Fleet, in command of Sir CHARLES HARDY, while on cruise in 1779. En route to America in the Fall of 1781, he had spent hours testing the field guns which he had brought with him. Later, in Bavaria, he was to bring the artillery of that country to a high state of efficiency; and it was while directing the operations of the Munich arsenal, that he carried out his classic cannon-boring experiments. These experiments silenced for all time the proponents of the materiality of heat, established it as a form of energy, and paved the way for the First Law of Thermodynamics.

There is a deep significance, therefore, in the interest he showed during this Long Island period in the manœuvering of artillery. To the King's American Dragoons were attached two small cannon—" grasshoppers " the Americans contemptuously called them. " I have tried our guns," wrote BENJAMIN THOMPSON, " & find them to answer admirably. And have lately astonished all the World by taking them upon Horse back. Three Horses carry the Gun with its Carriage, Ammunition Boxes &c, with the Greatest ease, and at any Pace. I have promised to show the Commander in Chief one of them taking a flying leap at a five Barr'd Gate; and I have little doubt but I shall be able soon to show him one swimming over a River. I have contrived a Breast-Plate for the Horse, (analogous to the Cork Waist Coats)

(7) Décade Philosophique — 22*d* Vol. Year VII (1799) 4th Semester 20 Fructidor-page 467.

which will effectually prevent his sinking with the weight of the Guns upon his back. Our Men are already so expert that They take the Gun with all its apparatus from the Horses back put it together and fire it in the space of one Minute and a quarter and in one Minute more it is on Horse's back again. It carries its round shott further and truer, and shoots its grape better than any Gun in the Service. I hit a tree the other Evening, (less than a large-mans body) at the distance of 300 yards three time in five shots, with single Bullets " (8).

For two months after the presentation of their colors the King's American Dragoons were encamped at Ireland Heights, near Jamaica. Sir GUY CARLETON, British Commander-in-Chief, in recognition of THOMPSON's ability, ordered SIMCOE's Queen's Rangersa nd the British (TARLETON's) Legion, to join him there. With these additions, " I shall have," remarked BENJAMIN, " a pritty command." Late in September the entire body of troops was shifted to Lloyd's Neck, forty miles from New York and five miles outside of Huntington. A few days later they were assigned to a semi-permanent station in Huntington. THOMPSON's command was now the most advanced detachment of British troops on Long Island.

The six square miles of rich land making up Huntington township had been purchased by the original settlers from the Indians at an amazing bargain, the agreed price being six coats, six bottles, six knives, six fathoms of wampum, thirty " muxes " and thirty needles.

Throughout the entire colonial period, Huntington citizens had been leaders in all movements for redress of grievances suffered under an arbitrary government. Friction with England began as early as 1665, when acquiescence by leading citizens in the " Duke's Laws," which gave the Duke of York absolute power and the people no voice in the government, aroused a storm of protest from their fellow townsmen. In 1774 the town issued its own Declaration of Rights, and delegated eighty men, trained for military service, to be ready to march wherever needed (9).

(8) THOMPSON to SACKVILLE, Aug. 17, 1782, Op. Cit.

(9) Handbook of Huntington; C. R. STREET, "History of Suffolk County, New York." N. Y. 1882.

Throughout the entire period of the Revolutionary War, the citizens of Huntington, so outspoken in defense of their liberties, suffered severely for their convictions. The British troops under Lord HOWE, driven from Boston early in 1776, sailed into Long Island Sound, defeated the Americans in the disastrous Battle of Long Island, and took possession for the remainder of the war. Huntington was one of the few locations chosen for permanent occupation, the bays on which it was situated being easy of access for ships, facilitating the transportation of army supplies.

The citizens of Huntington were sorely tried. "The whole country within the British lines was subject to martial law" and the administration of civil justice was suspended. The Army was a sanctuary for those guilty of robbery and other crimes, and the "grossest offenses were atoned by enlistment."

Many of those who had held commissions in the militia, or served as members of the town and county committees, fled for safety into the American lines; those who remained at home were harassed, often plundered of their property and subject to the orders of the British officers. They were compelled to work at any task assigned to them, and even to go with their teams on foraging expeditions; they were obliged to furnish blankets and fuel for the soldiers and hay and grain for their horses; their own horses and wagons, cattle, sheep, hogs, and poultry were seized without compensation, and they were perpetually exposed, both at the hands of soldiers and British refugees, to robbery, pillage, insult and abuse.

Only a bare subsistence was left them, and they knew not which to fear the more, the heavy hand of the military purveyor, or the ruffian fist of the plunderer.

Most of the acts of the British troops may be condoned as dictated by military necessity. But some may rightfully be called barbaric, and for them no apology can be accepted. Huntington was one of several towns where churches were violated. The First Presbyterian Church of Huntington, built in 1715, was the pride of the town, and its pastor, the Rev. EBENEZER PRIME, a fiery patriot. In 1777 the British declared that the church was needed for military purposes. The bell was carried off by Captain ASCOUGER and placed aboard a British vessel, "The Swan." An entrenchment was thrown up around the church,

" the seats in the house of God torn up, and the building converted into a military depot." Troops were immediately quartered in the house of the Rev. PRIME, his books and papers pitched out of the house, and made to litter the stables, and much of his furniture destroyed. The " old Rebel," as he was referred to by the British, remained outspoken and defiant until his death in 1779 (10).

With these events as background, it is certain that the citizens of Huntington gave BENJAMIN THOMPSON and his troops anything but a friendly reception. They would have been hated had their conduct been impeccable. To make matters worse, the situation demanded that THOMPSON do certain things which brought down on his head the wrath of all Huntington, and have caused him to be charged with unjust and vengeful conduct by every person who has written the history of Long Island from that day to this.

For the war was not over. It was absolutely necessary for THOMPSON to make his troops safe against the rigors of the approaching winter, to place them in a position where he could maintain strict discipline in order to prevent disaffection, and in a situation where they could defend themselves against attack.

The persistent rumor that Great Britain was now willing to acknowledge the Independence of the Thirteen Colonies had caused consternation among those who had remained loyal to the Crown.

The Loyalists on Long Island so feared " being up to the mercy of their Enemies," that a " state of Anarchy and Confusion little short of actual rebellion," existed. " In short," Colonel THOMPSON wrote, " an Universal Dispair and Phrenzy prevails within these lines, and I should not be suprised if very alarming consequences were to follow from the temper the people are in. They seem to be as void of prudence as they are destitute of Hope, and a kind of Language is now spoken publickly in the Streets that is enough to make one Tremble for what is to follow from These Convulsions... I cannot help thinking that we are not made acquainted with the whole of the Secret " (11).

(10) NATHAN S. PRIME, "A History of Long Island, from its first Settlement by Europeans to the Year 1845." N. Y. 1845, p. 65, 66, 251.

(11) THOMPSON to SACKVILLE, Aug. 6, 1782, Op. Cit.

Indeed, such was the case. The long drawn-out war was fast coming to a close. Even at this time, the peace commissioners were sitting, and the preliminary treaty of peace was signed on November 30, 1782. Without fast ships, cable, or radio, many months elapsed, however, before this intelligence reached America.

Not only did Colonel THOMPSON fear the effect upon the King's American Dragoons of the growing unrest among the British sympathizers, but he realized that he faced a far graver danger. Across Long Island Sound lay troops of the American Army under the personal command of GEORGE WASHINGTON; somewhere at sea was the French fleet. Which would be the first to attack Long Island? was the question which haunted BENJAMIN THOMPSON. His troops must be ready. Barracks and fortifications were therefore indispensable.

Colonel THOMPSON ordered the Presbyterian Church, which, as we have already seen, had been desecrated and made useless as a meeting house, completely torn down, as its timbers would furnish an immediate supply of material for construction work.

There was in the center of Huntington an ideal site for fortification—a hill of considerable elevation, the northern terminus of a range running to the southward. It commanded a view of the Harbor at Huntington, the bay, the sound, and even the distant Connecticut shore. From a military point of view there was no other location worthy of consideration. Here THOMPSON decided to place his fort. There was only one objection to this—the hill was the town burial ground. For more than one hundred years it had been a consecrated spot, and on its sloping sides were the graves of the founders of Huntington. Nearly every living citizen had relatives sleeping there.

To build a fort in the graveyard with materials obtained by tearing down the Presbyterian Church! It is easy to picture the consternation of the good people of Huntington when it was learned that this was the plan of the newly arrived British Colonel—and what made his conduct particularly offensive, he was an American-born Colonel. But the protest of the citizens of Huntington, whom the presence of the troops obliged to be circumspect in their expressions of horror, were as nothing compared to the clamor which Long Island historians have

continued to the present day, heaping maledictions on THOMPSON's head.

" THOMPSON, without any assignable purpose," wrote SILAS WOOD, " except that of filling his own pockets, by its furnishing him with a pretended claim on the British Treasury for the expense, caused a fort to be erected in Huntington, and without any possible motive, except to gratify a malignant disposition, by vexing the people of Huntington, he placed it in the centre of the public burying-ground, in defiance of a remonstrance of the trustees of the town, against the sacrilege of disturbing the ashes and destroying the monuments of the dead " (12).

" Without any assignable purpose, and without any possible motive." These are strong statements, and closer study of the circumstances surrounding the building of the fort proves them wholly unwarranted. THOMPSON was in very real danger. A surprise attack on New York by the French was so much feared that in December General ROBINSON, commanding in that city, arranged alarm posts for each corps, and directed that if an attack was made on Huntington " the Troops were immediately to assemble and march to the support of Colonel THOMPSON " (13).

There was still greater danger from the Continental troops. Before THOMPSON had finished building his fort, GEORGE WASHINGTON gave his approval to plans for an attack on him. These plans were prepared by a man who, at WASHINGTON's order, was keeping track of every move of the troops on Long Island, and who, like BENJAMIN THOMPSON, signed many of his reports simply " B. T." This was Major BENJAMIN TALLMADGE of the 2nd Light Dragoons in the American Army. A year younger than THOMPSON and a Yale graduate, he taught school for a time in Connecticut and joined the Continental Army in June 1776. He attracted the attention of GEORGE WASHINGTON, and in August 1778 was invited to dine with the Commander-in-Chief, who asked him to organize a " secret service " on Long Island to furnish information of actions of the British troops stationed there. TALLMADGE undertook the task, and during the

(12) SILAS WOOD, "Sketch of the First Settlement of the Several Towns on Long Island, with their Political Condition to the End of the American Revolution," Brooklyn 1828, pp. 118-119.

(13) BENCE JONES, "The Royal Institution," London 1871, p. 25.

four years before the arrival of BENJAMIN THOMPSON kept American Headquarters fully informed of every move of the enemy on the Island. THOMPSON was not long in Huntington before he appeared in the dispatches of " B. T." In the confidential correspondence of WASHINGTON with BENJAMIN TALLMADGE, under date of October 14, 1782, there is information from one of the latter's agents that " Col THOMPSONS Regt of Horse have gone down L. Island about 250 in number, supposed with a View to Sweep off the Cattle & forage from that Country. They live upon the Inhabitants as they Please, & committ the greatest acts of Violence. This would be a good opportunity to destroy that Corps." (14)

The suggestion of the informer appealed to TALLMADGE, who craved more active military service than the direction of a spy system, and he passed it on to the Commander-in-Chief with the comment : " If Col. THOMPSON should proceed to the East End of Long Island with his Corps, there would be a favorable opportunity to strike him on his return. If your Excellency judges proper, I should be happy to undertake an Enterprise of that kind..."

With characteristic caution WASHINGTON answered on the following day : " Tho I should consider it a very desirable thing, for the Corps of Cavalry which has gone to the East end of Long Island to be Cut off, yet under the peculiar circumstances of the present Moment I should not wish the Enterprise to be undertaken unless there should be almost a certainty of Success— With such a prospect I will by no means discourage the attempt." The General advised TALLMADGE to digest the plan thoroughly, to estimate the number of men and boats needed to assure the success of the operation and the " practicability of obtaining them in time & with secrecy. He closed with the admonition : " You will after making yourself as perfectly Master of the subject as possible : & Calculating the chances of succeeding or miscarrying in the execution of the Project. (if you should think it eligible to prosecute the affair) give me your farther Sentiments where on."

Encouraged by his Commander to proceed with his plan for

(14) Papers of GEORGE WASHINGTON, Vols 208-212 Mss. Library of Congress. Contains all the TALLMADGE-WASHINGTON Correspondence in re THOMPSON.

an attack, TALLMADGE instructed his agents to gather every available bit of information regarding THOMPSON's activities, and made secret preparations for an expedition across the sound. Word came to him—and was duly transmitted to WASHINGTON—that THOMPSON, in the manner of modern military commanders " took up all the houses and numbered them in order... that the whole detachment might be billeted." The British Colonel was close mouthed about his plans, " the inhabitants knew not of any of his business... except for the purpose of living upon them." His force, TALLMADGE informed WASHINGTON, should be quite easily cut off, for there were " no troops nearer him than the west end of Long Island; nor there is no appearance of any Armed Vessel to support him in the Sound."

For some time TALLMADGE continued of the opinion that THOMPSON intended to move eastward, although he might be deterred in this by " the frequency of Desertion which prevails among them... opportunities to escape increasing as they Proceed Eastward." This is not in accord with THOMPSON's earlier boast that there had " not been a desertion " since he took command. But perhaps the persistent rumors that Britain was to acknowledge the Independence of the American States injured the morale of his men, and caused them to consider the stigma of deserter a lesser handicap than an honorable discharge from the British Army.

TALLMADGE continued optimistic regarding the chance for success of his plan. " If they were encamped or cantoned in any compact situation," he wrote WASHINGTON on November 3rd, " I have no doubt that they might be totally cut off without much risque. I have been anxiously waiting for him to make a more favorable Position..."

Early in November it was apparent that the King's American Dragoons were preparing to stay in Huntington. " I am informed by a person on the spot," wrote " B. T.", " that Col. THOMPSONS Corps are preparing Quarters at Huntington for the Winter, & they will not probably move farther Eastward unless for the purpose of Collecting forage. They are Erecting some Works, for their Defense thro' the Winter, at the East End of the Town, near these parts the Troops are to be cantoned—The Infantry of the Reg^{t} which laid at & near Cold Spring have been removed

to Huntington." TALLMADGE is still eager to attack. " From the Present position of the Enemy, altho' they have not taken the Station first intended at Smith Town, I cannot but believe an Enterprise might be Conducted against the Corps, with Success —The Naval Guard in Huntington Harbour consists of only an Brig[a] a Sloop, & two small Gallies—But in a still night, I think we should have little to fear from them."

While across the Sound TALLMADGE impatiently awaited a favorable opportunity to attack, BENJAMIN THOMPSON made all possible speed in the construction of his graveyard fort, dubbed by inhabitants of Huntington " Fort Golgotha." On the fifth of November he issued the first orders for workmen to appear. On the seventh orders directed a Militia company of seventy-two men to give " the number of servants and waggons & Horses ox teams and oxen in each mans possession " and to send " one Quarter of the men with Axes Day by Day." Later " all the carpenters in Capt. CONKLIN's District " were to appear " by 8 O'Clock every morning with their tools... and no go away till Dismissed or they will not be Credited for a Days Work."

The Fort was erected in the astonishingly short time of fifteen days. Regardless of the remonstrance of the townspeople and civil authorities against the " desecration of Burying Hill," it swarmed with activity. The Militia from Dix Hills was compelled to bring spades, picks, axes, etc., and " engage in the unhallowed work of stripping a large area about the top of the hill of some 100 tombstones." These markers were carefully saved, and there being no other stone available, were used in the construction of tables and bake-ovens. The inhabitants of Huntington told for years after of seeing loaves of bread drawn from these ovens with the reversed inscriptions of the tombstones of their deceased friends on the lower crusts.

It is a circumstance stranger than fiction that the man who was to make outstanding contributions to culinary science should begin his experiments on baking in ovens made of tombstones.

When the site for the fort, some two acres in extent, had been levelled, men and wagons were pressed into service to throw up an earthwork around it. The outlines of this may be traced even today. The timbers and boards from the church served for the erection of shelters for the troops. In addition, 142 apple

trees from an adjoining orchard, and 3500 chestnut rails from nearby fences were requisitioned.

The completed fort covered about half of the burying ground, and, according to information forwarded by TALLMADGE to WASHINGTON, " the Front, which faces the North, is about 5 Rod in Front with a Gate in the Middle, it extends a Considerable Distance North and South, the Works were altogether of earth about Six foot high, no Piquets or any other obstruction to the Works except a sort of a Ditch which was very inconsiderable, some Brush like small trees fixed in the top of the Works, in a perpendicular form... The Troops Consist of THOMPSONS Regt the Remains of the Queens Rangers & the Legion being 550 effective, they are Quartered as Compact as possible in the inhabitants homes and Barns, and some Hutts along the sides of the Fort which makes one side of the Hut..."

Major TALLMADGE seems to have resorted to exaggeration of the depredations of THOMPSON's troops, in order to make an attack upon them appear the more desirable. He called WASHINGTON's attention to " the Distress under which our friends on Long Island labour from having such a body of Men quartered among them without Public Supplies of either forage or Provision. " I foresee more inconvenience to the Public," he wrote, " from this Detachment thro' the Winter, than from all the British Army." He told of " a party of horse " which went " Eastward on Long Island, & demanded one-half of all the Forage, which the Inhabitants are ordered to transport to Huntington... They have neither public forage nor provisions, but live upon the Inhabitants." True, THOMPSON requisitioned materials he needed, but always at a price. The town records of Huntington record transactions in the Fall and early Winter of 1782 involving : " One Cord of Nut wood, valued at L 3; 2 Bushels Corn & one & half cwt. English Hay, worth L1. 9 S.; 1 Load of Corn Stalks taken by Adjutant NICHOLSON und'r Command of Colonel THOMSON L1; 21 Shock of Oats at 5 pecks per Shock at 7 S per Bushell 26 Bushells L 9/2/; 1 half a Ton of Straw taken by order S'd Col. THOMSON for the Barracks L 1; 2 Horses taken by Major UPHAM of THOMSONS Dragoons on Command with a party Eastward gone 9 Days at 3 S, for a total of L 2/14; 1 Sadle took by S'd major and promised to return it tho' never don it L 2;

1 Day Service in Carting Rum to Huntington Harbour from the Eastward. 16 S."

Even while the fort was being built a Town Meeting voted that the " Garrison in Town should be supplied with Fuel at 4 Dollars 1 Cord " and appointed four men to see " that said wood was furnished and to Contract with Coll. THOMSON on the Best Terms." None of the food for THOMPSON's troops was requisitioned in the surrounding country, but was mainly brought in by boat from Connecticut (15).

WASHINGTON waited for some time before issuing orders for the attack on THOMPSON's citadel. The delay irked TALLMADGE's agents on Long Island, and tried the patience of the Major himself. " If my name was Major TALMAGS," one of his men wrote, " I surd shew these Lads what Rebbels Could due and that very shortly two." Goaded by this spy's impatience TALLMADGE respectfully addressed WASHINGTON on November 25th : " Presuming that a *Certain Manœuvre* is to take Place, I cannot but suggest that the present, of all other, would be the most favorable moment for an Enterprise against Col. THOMPSON's Detachment."

He was particularly anxious to make his sortie before hostilities broke out anywhere else, lest an attack upon some other point should call THOMPSON's detachment away from Huntington or put it on its guard.

THOMPSON was by no means averse to a test of strength with his opponents... " I am sure you will be pleased to find that I have something to amuse me," wrote THOMPSON to Viscount SACKVILLE soon after his arrival at Huntington. He delighted in the prospect of " a little War of my own—the only war permitted here." This was to be waged against the " Rebel Whaleboats, which absolutely swarm in the Sound... I have raised a Company of Boatmen from among the Lloydsneck people, and I intend fighting the Rebels with their own weapons. Nothing but a Whale-boat can catch a Whale-boat. If they come on shore I shall be ready to receive them... If they put to Sea my Boats will have fair play with them " (16).

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(15) Huntington, Long Island Town Records Vol III 1776-1873. Published 1889.

(16) THOMPSON to SACKVILLE, Oct. 7, 1782, Op. Cit.

In conformity with WASHINGTON's advice to " digest the plan thoroughly " TALLMADGE submitted a complete outline for the expedition. He requested that six Companies be sent to the place of embarkation for some " plausible reason " so that in case " bad Weather, a want of boats, probability of Detection or any unforseen Accident should frustrate the Attempt, the Troops would be perfectly ready for other Service..." He chose the place for landing, " Eaton's Neck, East of Huntington harbour, to prevent any Injury from the Enemies Guard boats, & to secure a safe Retreat in case of Difficulty, as the Neck is very narrow & long..." Finally, TALLMADGE desired a " few Dragoons under an officer... As the Enemies Cantonments are some what extensive, this Party being mounted on the spot, would do great execution among the fugitives..." Assuming that the move was successful if " it should be thought advisable, after Sending off the Prisoners, a sufficient number of Men might be mounted on the Captured Horses, & advanced a little to the Westward to Call the attention of the Enemy thus providing a cover for a safe retreat."

TALLMADGE supplemented his plan with the information that " THOMPSON had between five and six hundred men, two hundred and fifty being mounted." The camp was guarded by pickets. The two pieces of artillery, of whose feats THOMPSON was so proud, were to the American only " two small brass grass hoppers," that " stand on the hill by the old meeting house." Moreover, THOMPSON had no reinforcement nearer than Jamaica, about twenty-five miles away, while there were " one ship of 16 guns, 1 sloop of 10,—1 Galley—1 Gun Boat & Three Whale Boats in Huntington Harbour."

By a trip to Headquarters and a personal interview with the Commander-in-Chief, TALLMADGE secured WASHINGTON's approval of " this my favorite plan " and orders to make the necessary arrangements to carry it into execution. Finally, on December 3rd TALLMADGE received the long awaited message setting the zero hour. WASHINGTON directed, " You will therefore attempt to carry the proposed Plan into execution, on thursday Night the 5st inst unless some accident should intervene to prevent it—in conducting the business you will be governed entirely by your own discretion should anything happen to render the Enterprize

impracticable." A supplementary order made this date less definite and instructed TALLMADGE to "seize the first good opportunity within a week or ten days... and take every precaution to make the enterprise as successful as possible."

TALLMADGE's proposal had now become part of WASHINGTON's comprehensive attempt to drive the British from all Long Island and perhaps from New York State as well. He proposed to send an expedition down North River, a large body striking below Fort Washington while the main body, under his immediate command, moved against Fort Independence and Kingsbridge. With TALLMADGE's force striking simultaneously on Long Island, the enemy would find themselves attacked on all sides.

At last the night for TALLMADGE's adventure arrived (December 5, 1782). He had four companies of light infantry —chosen troops—a body of dismounted Dragoons, who, it was intended, would mount the captured enemy horses—and a detachment of Connecticut Levies, making a total of about seven hundred men. After the sun had set the Commander moved his troops stealthily to Shipan Point, where he had ordered his "little fleet" to assemble. Platoons were assigned to each boat, and embarkation began. But "before half of the troops had entered the boats," a squall of wind arose from the west, accompanied by rain, and became so boisterous that preparations for sailing had to be stopped. "The violence of the wind and rain, mixed with snow, continued through the night so that we were obliged to draw up our boats and turn them over to protect the troops from the pelting storm."

As Shipan Point was on a peninsula, the troops were cut off from all communication with the country, and could remain in position to pursue the enterprise the next night without their purpose being discovered. December 6th dawned bright, but the "face of the Sound was a perfect foam, so that no boat could have been kept above the water for five minutes." Throughout the day the wind blew. At sunset it abated and the troops made ready to embark. Boats were put into the water, but this seemed to bring a protest from the elements, for again the wind churned the water to foam and the waves rolled so high that a second night had to be spent in the same manner as the first.

TALLMADGE began to be apprehensive, fearing that some more

intrepid sailor had crossed " to give Information of our intention." His fears were unfounded, but on the morning of the 7th he received information that " three of the Enemies Armed Boats which had been sent over by Col. THOMPSON that Evening we arrived, were on an Island a little to the East... detained by the Wind." As soon as the weather moderated, TALLMADGE ordered six boats manned, to engage the enemy upon their embarkation for Long Island.

Captain BREWSTER, an experienced sailor, was placed in charge of the American boats, with orders to capture THOMPSON's men if possible. " The boats put off from the shore, and although their course was before the wind, 3 of them were obliged to turn back." The Enemy saw the boats bearing down upon them, " pressed all sail as well as oars, and steered for Long Island." BREWSTER laid his course so judiciously that before he reached the middle of the Sound (which is about 12 miles wide at this point) " he fell in with 2 of their heaviest boats." They engaged with great fury, the British boats suffering a loss of " six killed & about ten wounded," besides fifteen taken prisoners. The third boat reached the Island in safety and would in all probability warn THOMPSON of the proposed attack.

Even in view of the escape of " THOMPSON's Spy boat," TALLMADGE was not willing to abandon the project. He ordered the troops to embark, " knowing that if the enemy should be appraised of my intentions I should learn their situation the moment we landed on Long Island." But fate again intervened. Scarcely had boats put off shore when the weather grew severe and " many of the boatmen having shamefully gone off," the Major was obliged to return and admit that " further prosecution of the plan would be improper." The troops were ordered to rejoin their respective Corps.

TALLMADGE was heartbroken. He wrote to WASHINGTON : " Among all the disappointments of my life I never experienced such severe mortification before. I feel as completely unhappy as disappointed military ambition can make me; & it adds much to the misfortune that so important a blow could in all probability have been given the Enemy, with almost a Certainty of success."

Some time later, when TALLMADGE learned that Provisional Articles of Peace had been adopted a few days before his attempted

attack on THOMPSON's Encampment, he realized that his failure was a fortunate event. He wrote in his memoirs : " What is most worthy of notice, is the fact that when these two attempts were to have been made, in which doubtless many lives would have been lost, the preliminary articles of peace had been actually signed. This was not known to us " (17).

Events had proved THOMPSON's judgment correct. Protection from the severity of the winter by shelters made of materials taken from the Presbyterian Church had been essential to the welfare of his Regiment. His wisdom in building a fortification in the location most suitable from a military standpoint, even though it was a cemetery, is unquestionable, because of the real danger of attack, revealed by the plan of Major TALLMADGE, which only the inclemency of the weather prevented from being brought to fulfillment.

Lamentable as are some of THOMPSON's actions, the little known material which has been presented in this paper shows that they were not done to " gratify a malignant disposition," but were only those demanded by military necessity.

(Evanston, Illinois.)

LUCIA M. H. LOWRY.
C. D. LOWRY. Jr.
JOHN RICE MINER.

(17) Memoir of Col. BENJAMIN TALLMADGE. Prepared by Himself, at the Request of his Children. N. Y. 1858.

Léopold de Saussure (1866-1925)

A quelques kilomètres de Genève, LÉOPOLD DE SAUSSURE naquit le 30 mai 1866, dans ce site enchanteur du Creux de Genthod. Dès son enfance, il vit le lac devant lui. Marin d'eau douce au cours de toute son enfance, il se passionna rapidement pour la navigation et demandant à réintégrer sa nationalité française, il fit sa carrière dans la marine de guerre.

LÉOPOLD DE SAUSSURE appartenait à une famille lorraine qui, ayant embrassé la cause protestante, vint, antérieurement à la révocation de l'Édit de Nantes, se réfugier en Suisse. Établie à Genève depuis 1636, elle donna à cette ville un grand nombre de magistrats, de pasteurs et d'hommes de sciences. Parmi eux, citons : HORACE BÉNÉDICT DE SAUSSURE (*), le géologue genevois du XVIII*ème* siècle qui, le premier, organisa une expédition scientifique au sommet du Mont-Blanc; NICOLAS THÉODORE, chimiste et botaniste du début du XIX*ème* siècle qui fit d'importantes recherches sur la respiration des plantes.

Le milieu familial dans lequel LÉOPOLD DE SAUSSURE a grandi était propice à éveiller sa curiosité dans des directions diverses. Son père, HENRI DE SAUSSURE, était un entomologiste inlassable au travail, qui a écrit de nombreux ouvrages sur les insectes d'Afrique. Ce n'était du reste pas un spécialiste à l'esprit étroit. Il était un de ces encyclopédistes qui n'étaient pas rares à la fin du siècle dernier. Il publia divers travaux de géologie, de géographie, d'anthropologie et même d'agriculture.

HENRI DE SAUSSURE aimait à voyager; il avait un cercle très étendu de relations. Causeur très brillant, des savants du monde entier venaient le visiter et très jeunes, ses enfants entendirent discuter autour d'eux les problèmes les plus variés.

(*) DOUGLAS W. FRESHFIELD and HENRY F. MONTAGNIER. The life of H. B. DE SAUSSURE (London 1920; *Isis* 6, 64-71).

Léopold de Saussure
1866-1925

Avec ses frères même, LÉOPOLD DE SAUSSURE pouvait s'entretenir de sujets scientifiques. Son aîné, FERDINAND, avait publié à l'âge de 21 ans un ouvrage sur « Le système des voyelles indo-européennes » qui devait lui valoir d'emblée une notoriété parmi les linguistes. Son frère cadet, RENÉ, mathématicien précoce, publia un mémoire sur la géométrie des feuillets. Les uns et les autres cultivaient du reste des intérêts dans des domaines très divers. Il n'était pas inutile de rappeler ces origines car elles expliquent ce qui a caractérisé la valeur des recherches de LÉOPOLD DE SAUSSURE. Il a toujours embrassé les problèmes auxquels il s'est attaqué d'une manière synthétique, les considérant à la fois du point de vue du sinologue, de l'astronome et du marin.

Entré en 1882 à l'école navale du Borda, il devait fonctionner comme enseigne de vaisseau dès 1885. En 1887, SAUSSURE quitte temporairement son service pour suivre les cours de l'École des langues orientales. Il était le premier officier de marine français qui fit cette demande.

De 1888 à 1891, il séjourna à bord de la canonnière « l'Aspic » en Extrême Orient. C'est là que se dessina sa future carrière de sinologue. Promu lieutenant de vaisseau en 1892, il fit ensuite campagne au Dahomey. Pour des raisons de famille, il donna sa démission de la marine en 1899.

Officier distingué, il reçut en 1891 la médaille de chevalier de l'ordre royal du Cambodge, en 1893, la médaille commémorative de l'expédition du Dahomey, en 1897, celle de chevalier de l'ordre de l'Étoile noire. En 1898, il était nommé chevalier de la légion d'honneur.

Bien que retiré de la marine, SAUSSURE continua à s'intéresser à tous les progrès de la défense navale et durant la guerre, il écrivit dans le *Journal de Genève* des chroniques régulières sur la guerre navale. Là encore, son esprit très ouvert le poussa à déborder le cadre de sa spécialité et il consacra de nombreux et fort intéressants articles à la politique générale de cette époque.

SAUSSURE n'avait pas attendu les tragiques événements de 1914 pour s'intéresser aux questions politiques. En 1899, il avait publié un ouvrage sur la « Psychologie de la colonisation française » qui dénote de façon aiguë ses qualités de psychologue et de politicien. On est frappé dans cet ouvrage écrit à 33 ans, par le sens

historique de l'auteur et son besoin de s'élever à des conceptions générales dès qu'il touche à un sujet.

Marin d'eau douce, il est conduit à s'intéresser aux problèmes plus généraux de la navigation; transporté en Extrême Orient, il éprouve le besoin de connaître les langues des pays qu'il parcourt; officier des colonies, il dégage les tâches essentielles du français colonisateur et il s'élève aux plus hautes conceptions de la stratégie navale. Appelé à se servir de la boussole et à passer de longues nuits sur le pont d'un bateau, il devient astronome. Dans tous les domaines, LÉOPOLD DE SAUSSURE éprouve le besoin de se placer à un point de vue plus large pour obtenir une maîtrise plus complète dans la tâche qui lui est assignée.

Dans sa « Psychologie de la colonisation française », SAUSSURE s'élève contre la théorie de l'assimilation des indigènes comme principe de colonisation. Après avoir noté que ce principe fait abstraction de lois biologiques fort importantes, notamment de l'hérédité mentale, il montre à quelles absurdités la méthode de colonisation a conduit dans le domaine de l'instruction et de l'administration.

L'esprit scientifique de SAUSSURE apparaît ici dans sa façon d'attaquer certains dogmes soi-disant humanitaires en démontrant leur nocivité par les résultats de l'expérience.

« La foi en la vertu immanente de ces principes, écrit-il, est en effet tellement aveugle que l'on ne songe pas un instant à les incriminer. Tous les partis s'entendent pour attribuer le mal soit à l'incapacité de tel ou tel fonctionnaire, soit au fait que l'application des principes n'a pas été assez radicale. On change les fonctionnaires et de nouveaux décrets viennent compléter l'œuvre théorique des premiers »

« Les choses vont alors de mal en pis; tôt ou tard, il arrive un moment où la réalité s'impose et où, sous la pression de la nécessité, il faut accepter un compromis, renoncer à l'application intégrale des principes. On acquiert ainsi, malgré soi, une certaine expérience, mais cette expérience ne profite pas, elle est limitée au cas qui lui a donné naissance : pour la généraliser, il faudrait d'abord en tirer la conclusion logique, c'est-à-dire admettre que les principes sont incompatibles avec la réalité. Et comme cette expérience n'a pas affleuré les esprits, l'expérience reste localisée et stérile. Un nouveau problème vient-il se présenter, on assiste aux mêmes insuccès, on voit se renouveler le même cycle d'erreurs. » « Les dogmes ont ainsi survécu côte à côte avec l'expérience qui les condamne : ils doivent cette invulnérabilité à ce qu'ils sont invisibles. Ceux qui les proclament hautement ne sont qu'une très faible minorité de fanatiques, mais règnent à l'état latent sur la nation » (p. 75 et 76).

J'ai fait cette longue citation, car elle a aussi sa valeur dans l'histoire des sciences.

Si SAUSSURE s'oppose au dogme de l'assimilation, il comprend parfaitement la tâche civilisatrice qui incombe aux nations plus avancées.

« Une nation civilisée, écrit-il, peut exercer (et il est de son devoir de le faire) une direction salutaire sur les sociétés indigènes soumises à sa domination. Personne ne songe à préconiser le statu quo absolu. Mais cette direction doit être inspirée par une connaissance approfondie de leur état social et être conforme à leurs besoins et à leurs tendances » (p. 113).

A 26 ans déjà, SAUSSURE avait envoyé au *Globe*, organe de la Société de géographie de Genève, d'intéressantes relations sur la Corée.

C'est en 1907 que SAUSSURE commence à publier ses articles sur l'astronomie chinoise dans l'antiquité (nº du 28 février de la *Revue générale des Sciences*). La même année, il publie dans les *Archives des sciences physiques et naturelles de Genève* (nº du 15 juin et du 15 juillet) ses Prolégomènes d'astronomie primitive comparée et sa Note sur les étoiles fondamentales des Chinois. La même année, il publie encore le texte astronomique du Yao Tien (*T'oung Pao* 1907 pp. 301-390).

Ces premiers articles furent de suite remarqués par l'illustre astronome P. PUISEUX qui les analysa dans le nº d'octobre 1908 du *Journal des Savants*. Voici ce qu'il écrit à leur sujet :

« Il résulte en effet d'un document mis en lumière par le Père P. GAUBIL, mais récemment encore mal interprété que, deux mille ans avant notre ère, les Chinois avaient déjà fondé la description du ciel sur des bases rationnelles et précises. Ils savaient déterminer la durée de l'année, les dates des saisons. Ils rattachaient ces dates à l'observation de certaines étoiles aussi judicieusement choisies que nous pourrions le faire aujourd'hui. Et pour arriver à ce résultat, ils devaient noter les heures de passage d'étoiles par le méridien, posséder des garde temps (horloges ou clepsydres), en un mot posséder les méthodes devenues chez nous, depuis deux siècles, la base de l'astronomie de précision, mais dont les Egyptiens, les Chaldéens, les Grecs et les Arabes ne semblent avoir tiré aucun parti »

« Telle est la thèse hardie que L. de SAUSSURE développe dans les quatre études récentes dont nous avons donné les titres et dont la dernière résume et complète les autres. Cette entreprise, si le succès la couronne, intéressera vivement les astronomes en leur montrant qu'ils ont eu, dans l'application de leurs méthodes actuelles, des devanciers longtemps insoupçonnés...

...Les historiens modernes de l'astronomie chinoise ont trop souvent suivi leurs prédécesseurs sans les contrôler. Tous ont écrit sous l'empire de cette idée que l'étude du ciel, chez les anciens, est essentiellement zodiacale et écliptique, qu'elle

est née du désir d'assigner la route des astres mobiles parmi les étoiles. Et cela, en effet, peut se soutenir si l'on ne parle que des races indo-germaniques. Partant de cette notion, on ne peut guère manquer de trouver le texte du Yao-tien obscur ou suspect. On sera tenté de diminuer son autorité, de lui contester sa date, par exemple, d'admettre avec le Prof. WEBER de Berlin, que la destruction des livres ordonnée par l'empereur TS'IN-CHE-HOUANG-TI a eu un effet radical, de sorte que nous ne savons rien de ce que les Chinois ont pu noter dans le ciel antérieurement au III*ème* siècle avant notre ère.

« Mais l'interprétation de BIOT fait intervenir comme élément essentiel la haute antiquité du Yao-Tien. Quatre étoiles y sont distinguées comme marquant le milieu des saisons. Ces quatre étoiles divisaient l'équateur en quadrants égaux 2.200 ans avant notre ère. Elles ne remplissaient pas cette condition mille ans avant, ni mille ans après, moins encore aux dates plus récentes. On rejettera donc, comme fondée sur une erreur historique, la version de BIOT, et l'on se croira dispensé d'examiner des concordances qu'il emprunte à l'astronomie. De fait, les commentaires modernes passent à côté de ces preuves sans leur faire l'honneur de les discuter.

« Or, ces preuves, mises sous forme de graphique par L. DE SAUSSURE, sont au contraire tellement précises et claires qu'elles nous obligent à rapporter à la date traditionnelle au moins une partie de Yao-tien. Ce document n'aurait pu être forgé à une date ultérieure que par un faussaire sachant appliquer correctement la précession des équinoxes. C'est une hypothèse qu'il n'y a pas même lieu d'envisager. »

« Cela ne veut pas dire que le texte nous soit parvenu inaltéré. EDOUARD CHAVANNES, dont l'autorité est grande en ces matières, y voit des fragments d'un ancien almanach, enchassés dans un traité plus récent. GAUBIL et BIOT, conduits par un heureux instinct, sont allés droit au plus important. Leurs successeurs se sont laissés égarer par un contexte de valeur moindre, plutôt fait pour obscurcir la pensée primitive. Mais un astronome, même étranger à l'exégèse des textes chinois (tel est notre cas, nous devons l'avouer) ne manquera pas de retenir comme capitale la mention de quatre étoiles qui, observées aux méridiens, à la même heure solaire, au milieu des saisons, conduisent à quatre dates concordantes pour le règne de Yao. Toutes les tentatives faites pour assigner à l'observation de ces quatre étoiles une heure solaire variable, comme celle du crépuscule, aboutissent à un échec manifeste. Le calcul fait correctement donne alors pour les quatre dates correspondantes du Yao-tien des écarts de 20 à 30 siècles.

En l'absence de tout autre renseignement, on pourrait dire que l'on est en présence d'une coïncidence heureuse, mais fortuite. A cela L. DE SAUSSURE oppose de nombreux indices qui témoignent dans le même sens : la tradition d'abord, qui place précisément à 42 siècles de nous le règne de YAO, les nombreux textes qui ont amené GAUBIL à reconnaître, malgré lui en quelque sorte, que les anciens Chinois rapportaient les étoiles à l'équateur et non à l'écliptique comme tout l'occident le faisait récemment encore; enfin d'autres livres mis en lumière depuis BIOT et qui nous montrent la persistance de cette pratique. Ainsi, dans les Mémoires historiques de SI-MA-T'SIEN publiés par EDOUARD CHAVANNES en 1895, l'étoile polaire est appelée le Faîte du Ciel, la région polaire le palais central. Ils attribuent aux étoiles circompolaires des influences occultes, une prédestination religieuse. Ils ne font intervenir aucun mythe solaire, aucune considération écliptique et zodiacale.

« Mais tous ces arguments empruntés à l'érudition, et que nous n'avons pas qualité pour apprécier pouvaient être laissés de côté, tant est précise la preuve

astronomique, tirée de la situation des étoiles fondamentales usitées à toutes les époques et auxquelles une tradition constante a gardé les mêmes noms.

« En effet, ainsi que BIOT l'a reconnu et que L. DE SAUSSURE le montre avec encore plus d'évidence, ces étoiles fondamentales, toutes à proximité de l' équateur, se partagent en trois groupes : quatre étoiles qui passaient le méridien, au milieu des saisons, en même temps que le soleil moyen; quatre autres introduites longtemps après pour remplacer les premières, quand l'arrangement primitif eut été troublé par la précession des équinoxes; vingt étoiles enfin qui correspondent en angle horaire aux circompolaires principales, soit à leur passage supérieur, soit à leur passage inférieur. Les cercles horaires ainsi matérialisés se succèdent à des intervalles très inégaux. Mais c'est la disposition même des circompolaires existantes qui imposent cette irrégularité.

« Telle est la rigueur de ces coïncidences que toute théorie qui veut, sans en tenir compte, motiver autrement le choix des étoiles fondamentales doit être considérée comme faisant fausse route. L'astronomie chinoise, loin d'être une importation indienne, est profondément originale. Elle a devancé de loin tout l'occident dans la voie ouverte pour nous par ROEMER et qui a donné bientôt après de si éclatants résultats entre les mains de BRADLEY ».

SAUSSURE n'en est pas resté à ces premiers articles. Pendant vingt ans, il a travaillé avec acharnement, malgré la maladie qui souvent le clouait au lit des mois entiers, à élucider les problèmes de l'origine de l'astronomie chinoise.

Après sa mort, tous ces articles, qui ne représentent du reste qu'une partie de ses recherches sur l'astronomie orientale furent recueillis en un volume. (1)

LÉOPOLD DE SAUSSURE, à la suite de ses premiers travaux, avait pensé que la Chine était parvenue par elle-même à un système astronomique original et plus précis que le système chaldéo-grec. Dans la suite de ses recherches, comme le montre la lettre que nous reproduisons ci-après, il a reconnu la grande influence indo-iranienne sur le système astronomique chinois. (**)

Dans le domaine de l'étude de l'astronomie et de la cosmogonie chinoises antiques, écrit de SAUSSURE à la date du 2 juillet 1925, je reste un isolé. Sous ce rapport, l'article que vous avez publié dans *l'Illustration* du 27 juin 1925 (Race blanche et race jaune) m'intéresse au plus haut point, car il est en connexion intime avec les conclusions auxquelles j'ai été conduit par ma découverte de l'identité complète (dans les détails comme dans les traits généraux) de la cosmologie iranienne avec celle de la Chine. Vous pouvez voir ce que j'ai publié dans le *Journal asiatique* : *Le système cosmologique sino-iranien* (t. CCII, avril-juin 1923,

(1) Voir LÉOPOLD DE SAUSSURE. *Les Origines de l'astronomie chinoise.* (Paris, Maisonneuve 1930, 594 p., *Isis* 17, 267-71).

(**) Lettre de LÉOPOLD DE SAUSSURE au Dr LEGENDRE, publiée dans *La Nature* 15 mai 1926, supplément p. 157. (Extrait de *Les Origines de l'Astronomie chinoise*, Préface P. IX).

pp. 235-297) et *La série septénaire cosmologique et planétaire* (t. CCIV, avril-juin 1924, pp. 333-370). Tout d'abord, j'ai incliné à croire le système *importé* de Chine en Iran, mais j'ai bientôt reconnu le *contraire*. Les iranistes allemands ont reconnu l'exactitude de mes constatations (voir les annotations de H. JUNKER et de H. LOMMEL dans l'article précité de 1923, p. 237, note p. 295, note). Dans le *Journal asiatique* de janvier-mars 1924, (t. CCIV, pp. 1-100), M. HENRI MASPERO a publié un article intitulé : *Légendes mythologiques dans le Chou-king*, dans lequel, tout en déclinant la discussion d'ordre technique, il affirme que l'astronomie et le système cosmogonique classiques ont été importés postérieurement à CONFUCIUS. Il ne me sera pas difficile de réfuter cette assertion et de montrer que, indépendamment des mythes grossiers encore en cours au *5ème* siècle avant notre ère (probablement autochtones, antéhistoriques, communs aux peuplades sauvages indochinoises), *le remarquable système indo-iranien* avait été implanté en Chine et considéré comme antique, avant l'élaboration préconfucéenne du *Chou-King*. Cette première étape de la démonstration constituera déjà un terrain d'entente, mais je ne puis l'admettre que comme une concession provisoire utile à la dialectique. Car l'importation du système aryen remonte *plus haut* : à la dynastie des « Hsia » (ou « Hia » qui règna de 2205 à 1766 avant notre ère) dont le calendrier incontesté est une *évidente application* du système indo-iranien. Autant que j'en puis juger actuellement, il y aurait eu une pénétration *continue* des concepts *aryens* depuis l'antiquité légendaire chinoise.

Je résume ainsi les conclusions de l'analyse astronomique comparée : dans la haute antiquité (25*ème* siècle environ, avant notre ère) s'est constitué un système, foncièrement différent du système babylonien, basé sur la division homologue du ciel et de la terre en cinq régions, dont une centrale, siège du souverain, et quatre périphériques, système essentiellement *polaire et équatorial*, fondé sur le zodiaque dit *lunaire*, dont le principe établi sur l'observation de la pleine lune au méridien est *incompatible* avec le principe *chaldéo-grec* établi sur l'observation sidéro-solaire à l'horizon. Ce système, tant dans l'Inde, dans l'Iran qu'en Chine, a conservé les quatre points cardinaux du ciel identiques, correspondant aux équinoxes et solstices du 25e siècle. Ces quatre astérismes cardinaux sont indiqués dans le *Chou-king* et si M. H. MASPERO peut écarter l'évidence qui en résulte, c'est qu'il s'interdit de « faire l'histoire de l'astronomie ». Sur le lien de ce texte du *Yao-tien* avec le calendrier chinois, voir *Une interpolation du Che-ki* dans le prochain numéro du *Journal asiatique* (1). Le calendrier des « Hsia » et le texte du *Yao-tien* témoignent d'une science plus avancée que celle de HAMMOURABI. On est ainsi amené à admettre que l'Inde a précédé Babylone. D'autre part, le symbolisme *zoaire*, comme vous le signalez, confirme une origine *occidentale* des symboles chinois. Vous connaissez sans doute les vues de M. d'ARDENNE DE TIZAC et de M. GIESELER. Mais ces auteurs ne remontent pas, je crois, aux temps antiques.

Cet exposé se résume dans la connexion entre nos recherches, lesquelles aboutissent à la constatation *d'une importation en Chine* des éléments de supériorité de la race blanche. Mais cette importation, d'après les données du système astronomico-cosmologique, est beaucoup plus ancienne que l'on ne croit généralement.

N'étant ni astronome, ni sinologue, il nous est difficile de

(1) T.CCVI avril-juin 1925, p. 265-302. Ce fascicule a paru plusieurs mois après la date indiquée sur la couverture par suite des retards apportés à son impression et DE SAUSSURE n'a pu corriger les épreuves de son article (cf. p. 302, note).

prendre parti pour ou contre les idées de SAUSSURE. Celles-ci ont rencontré beaucoup de fervents adeptes en Allemagne et des adversaires nombreux en France sans que toutefois les camps des adversaires et des adeptes correspondent exactement avec cette différence de nationalité. Aussi avons-nous cru bien faire en reproduisant ici l'avis impartial d'un sinologue aussi avisé que Monsieur PELLIOT.

Les recherches de L. DE SAUSSURE sur l'ancienne astronomie chinoise étaient suivies par CHAVANNES avec un intérêt confiant, et elles ont emporté l'adhésion enthousiaste de certains de nos confrères particulièrement en Allemagne. Je ne suis pas sûr cependant que tout s'en avérera à l'épreuve également solide. Il est difficile, à qui n'est pas astronome, de se prononcer catégoriquement sur de tels problèmes. Pour autant que j'en puisse juger, l'un des grands mérites de L. DE SAUSSURE a été d'insister sur le caractère équatorial, et non écliptique, de l'ancienne astronomie chinoise. Mais, par ailleurs, DE SAUSSURE a été amené à prêter à l'astronomie chinoise une précision et une antiquité de tradition qui, pour le milieu du troisième millénaire avant notre ère, me paraissent encore assez problématiques. La rigueur apparente des déductions ne doit pas faire oublier que DE SAUSSURE lui-même a modifié assez souvent des points de vue qu'il avait d'abord présentés comme définitifs. Notre confrère croyait en des textes parfois suspects, voire certainement apocryphes, et son extrême ingéniosité leur trouvait toujours une explication satisfaisante; cela même m'incline à quelque hésitation dans d'autres cas où son raisonnement me paraît au premier abord convaincant. C'est que les problèmes sont d'importance. A côté de l'extrême antiquité éventuelle de l'astronomie chinoise, ils impliquent ceux d'anciennes relations possibles entre la Chine et l'Asie centrale et occidentale. Après avoir été un tenant résolu de l'originalité absolue du système chinois, DE SAUSSURE, à la fin de sa vie, faisait intervenir de plus en plus le monde iranien. C'est merveille que, dans un état de santé aussi précaire — il ne pouvait guère lire, couché, plus de deux heures par jour — et dans un isolement qui ne lui permettait pas un échange de vues constant avec ses confrères, DE SAUSSURE ait pu faire ce qu'il a fait. Il est mort au moment où son horizon était le plus large et où une nouvelle synthèse se fût peut-être imposée à sa parfaite droiture dans un délai rapproché.

LEOPOLD DE SAUSSURE avait encore le projet d'écrire divers articles qui auraient été la synthèse de ses recherches antérieures, mais terrassé par la maladie, il succomba avant de réaliser ses projets le 30 juillet 1925.

(Prangins, près Nyon, Suisse) RAYMOND DE SAUSSURE

BIBLIOGRAPHIE DES ÉCRITS PRINCIPAUX DE LÉOPOLD DE SAUSSURE

M. PAUL PELLIOT a eu la bonté de nous permettre de reproduire la bibliographie publiée par lui dans *T'oung Pao*, vol. 24, 298-300, 1926 et nous lui en sommes reconnaissant. Nous la reproduisons ci-dessous avec quelques additions et corrections. Les références à *T'oung Pao* se rapportent généralement à des critiques de M. PELLIOT. Le numérotage de M. PELLIOT a été conservé; pour ne pas le déranger nous avons affecté aux articles omis par lui des numéros *bis*. Ceci permet de reconnaître de suite nos interpolations.

1. Note sur la Corée (*Le Globe*, organe de la Société de géographie de Genève 1892).
2. La Chine et les puissances occidentales (*Le Globe*, Mém. XXXIV, 1895, 23-65).
3. Comment les Chinois conçoivent leur civilisation et leur empire (*Revue générale des sciences*. Ser. IV, t. III (1895), 65-72).
4. Psychologie de la colonisation française dans ses rapports avec les sociétés indigènes. Paris, ALCAN 1899.
5. Condition morale des indigènes (*Congrès international de sociologie coloniale*. Paris 1900).
6. Prolégomènes d'astronomie primitive comparée (*Archives des sciences physiques et naturelles*, Genève 15 juin 1907; cf. *T'oung Pao*, 1908, 708-713).
7. Note sur les étoiles fondamentales des Chinois (*ibid.* 15 juillet 1907; cf. *T'oung Pao*, 1908, 708-713).
8. L'astronomie chinoise dans l'antiquité (*Revue générale des sciences*, Paris, 28 février 1907, cf. *T'oung Pao*, 1907, 140 et 1908, 708-713).
9. Le texte astronomique du Yao-tien (*T'oung Pao*, 1907. 301-390 et 559-561; cf. aussi *ibid.*, 1908, 708-713).
10. Le cycle de Jupiter (*T'oung Pao*, 1908, 455-475).
11. Origines de l'astronomie chinoise. Introduction. A. L'origine

(*) Nécrologie par P. PELLIOT. *T'oung Pao*, n° 2 et 3. Année 1925-26.

des sieou (*T'oung Pao*, 1909, 121-182; cf. 1910, 157); B. Les cinq palais célestes (*ibid.*, 1909, 255-305); C. La série quinaire et ses dérivés (*ibid.*, 1910, 221.292); D. La série des douze « tche » (*ibid.* 1910, 457-488); E. Le cycle des douze animaux (*ibid.*, 1910, 583-648); F. La règle des Cho-t'i (*ibid.*, 1911, 347-374); G. Le cycle de Jupiter (*ibid.* 1913, 387-426, et 1914, 645-696); H. Les anciennes étoiles polaires (*ibid.*, 1921, 86-116); I. Le zodiaque lunaire, première partie (*ibid.*, 1922, 251-318). La suite n'était pas rédigée à la mort de l'auteur. *Isis* 3, 131; 5, 529.

12. Note à propos du caractère t'oung (*T'oung Pao*, 1913, 808-9). N.B. il s'agit du caractère 12, 285 (GILES).
13. Lettre sur le calendrier de 63 av. J.C. retrouvé par Sir AUREL STEIN et publié par CHAVANNES (*T'oung Pao*, 1914, 463-464).
14. Le zodiaque lunaire asiatique (*Arch. des Sc. phys. et nat.*, mars-avril 1919, 105-126).
15. Le système astronomique des Chinois (*ibid.* mai-juin 1919, 186-216; déc. 1919, 561-588; mai-juin 1920, 214-231; sept.-oct. 1920, 325-350). *Isis* 4, 176-177.
16. L'horométrie et le système cosmologique des Chinois (Introduction par L. DE SAUSSURE à A. CHAPUIS, La montre chinoise, Neuchâtel 1919 in 4; cf. *T'oung Pao*, 1920, 124 1921, 61-68). *Isis* 4, 644.
17. Le cycle des douze animaux et le symbolisme cosmologique des Chinois (*Journal asiatique*, janv.-mars 1920, 55-88). *Isis* 4, 612.
18. La symétrie du zodiaque lunaire asiatique (*ibid.*, juillet-août 1919, 141-148). *Isis*, 4, 173.
19. Le voyage du roi MOU au Turkestan oriental (*ibid.*, juillet-sept. 1920, 151-156).
20. La Tortue et le Serpent (*T'oung Pao*, 1920, 247-248).

20' Une société des nations dans l'antiquité chinoise [*Journal de Genève*, 16 février 1920 (2 col.)].

21. La relation des voyages du roi MOU (au X^e^ siècle avant J.C.) (*Journal asiatique*, avril-juin 1921, 247-280; cf. *T'oung Pao* 1922, 98-102). *Isis* 5, 529.
22. Le voyage de MOU-WANG et l'hypothèse d'ED. CHAVANNES (*T'oung Pao*, 1921, 19-31).

23. The calendar of the *Muh t'ien tsz chuen* (*New China Review*, vol. 2, 513-516, 1920). *Isis* 4, 426.
24. On the origin of the ideo-phonetic characters (*ibid.*, 1921, 389-392).
25. The Lunar Zodiac (*ibid.*, 1921, 453-459).
25' Le système cosmologique des chinois (*Revue générale des sciences*, vol. 32, 729-36, 1921). *Isis* 5, 267.
26. L'étymologie du nom des monts K'ouen louen (*T'oung Pao*, 1921, 370-371), *Isis* 5, 268.
27. On the antiquity of the Yin-Yang theory (*New China Review*, 1922, 457-463).
28. Une interpolation du *Che ki*. Le tableau calendérique de 76 années (*Journal asiatique*, juillet-sept. 1922, 105-135, cf., infra n° 38). *Isis* 7, 179.
29. Origine chinoise de la cosmologie iranienne (*ibid.*, oct.-déc. 1922, 302-306).
30. Origine babylonienne de l'astronomie chinoise (*Arch. des sciences phys. et nat.* vol. 5, 5-18, Genève 1923). *Isis* 5, 530.
31. L'origine de la rose des vents et l'invention de la boussole (*ibid.*, 1923, nos 3 et 4; tirage à part de 68 pages; cf. *T'oung Pao* 1924, 51-54). *Isis* 6, 208.
32. La cosmologie religieuse en Chine, dans l'Iran et chez les prophètes hébreux (*Actes du Congr. intern. d'hist. des religions*, tenu à Paris en oct. 1923, Paris, Champion, 1923, in 8. 11, 77-92).
33. Le système cosmologique sino-iranien (*Journal asiatique*, avril-juin 1923, 235-297). *Isis* 10, 239.
34. Sur l'inanité de la chronologie chinoise officielle (*ibid.*, oct.-déc. 1923, 360-362). *Isis* 10, 239.
34' La cosmologie chinoise à propos du nouveau drapeau chinois. (*Isis*. vol. 5, 140-2, 1923).
35. La série septénaire, cosmologique et planétaire (*Journal asiatique*, avril-juin 1924, 333-370). *Isis* 10, 263.
36. La chronologie chinoise et l'avénement des Tcheou (*T'oung Pao* 1924, 287-346, et 1932, 276-86). *Isis* 25, 262.
37. L'origine des noms de Mer Rouge, Mer Blanche et Mer Noire (*Le Globe*, vol. 63, 23-36, 1924). *Isis* 9, 201.
38. Une interpolation du *Che ki*. Note complémentaire. (*Journal asiatique*, avril-juin 1925, 265-362). *Isis* 10, 108.

39. Note sur l'origine iranienne des mansions lunaires arabes (*ibid.*, juillet-sept. 1925, 166-168).
40. Astronomie et mythologie dans le *Chou king*. Travail ms. transmis à M. PELLIOT en trois rédactions successives des 2, 11 et 21 juin 1921, mais encore inédit.
41. L. DE SAUSSURE avait fourni à M. G. FERRAND, pour ses « Instructions nautiques et routiers arabes et portugais des XV^e^ et XVI^e^ siècles » un certain nombre de notes se rapportant à la navigation, et que M. FERRAND publiera dans les tomes III-IV de son ouvrage.
41. *Les origines de l'astronomie chinoise*. x-594-IV p., 39 fig. Paris, MAISONNEUVE 1930. Réimpression d'articles publiés dans *T'oung Pao*. Voir comptes rendus par E. ZINNER (*Vierteljahrschrift der Astronomischen Gesellschaft* 66, 21-23, 1931) et ALEXANDER POGO (*Isis* 17, 267-71, 1932).

EXTRAITS DE LETTRES ADRESSÉES PAR LÉOPOLD DE SAUSSURE A GEORGE SARTON

Les extraits suivants sont publiés ici parce qu'ils illustrent et complètent l'article de M. le Dr. R. DE SAUSSURE. Ils serviront à mieux faire comprendre au lecteur la genèse des idées de LÉOPOLD DE SAUSSURE, aussi bien que l'honnêteté foncière et l'héroïsme intellectuel de ce savant que des malaises continus et une maladie implacable ne purent jamais détourner de son but.

i Genthod, Genève, le 14 janvier 1918.

Monsieur,

Étant alité je ne puis malheureusement pas répondre comme je le voudrais à votre aimable communication. Je me bornerai donc à l'essentiel en me réservant de faire mieux si ma santé se rétablit.

Mon ouvrage principal *Les origines de l'astronomie chinoise* a été interrompu par la guerre et je ne sais quand je pourrai le reprendre. Tous mes travaux antérieurs doivent être considérés comme *périmés* et même dans les premiers chapitres des *Origines* j'aurais beaucoup à modifier. — Dans ce domaine inexploré, la pensée évolue à mesure que l'on défriche. Je ne puis donc pas vous engager à étudier mon travail, mais j'approuve votre idée

de voir dans ce sujet un élément important de l'histoire des sciences. Si ma santé se rétablit j'aurais un millier de pages à ajouter et notamment sur l'aspect religieux des notions astronomiques primitives.

Vous pourrez trouver une appréciation d'ensemble de mes travaux 1° dans la grande revue allemande de la science des religions (Berlin-Leipzick) 1915, dans un article consacré aux publications relatives à la Chine (Je n'ai malheureusement pas le titre exact, me trouvant dans une clinique, sans mes documents); 2° dans le Journal des Savans (organe de l'Institut de France) de 1909 sous le titre : le plus ancien document astronomique; 3° dans l'article *Nakshatra und Silou* par le professeur OLDENBERG publié dans la périodique de la Société Scientifique de Göttingen (critique partiellement fondée et parfois très erronée), 1909.

En résumé, j'espère faire une synthèse mais dans un nombre d'années indéterminé car mon travail est encore très loin d'être achevé.

En vous remerciant de votre bienveillante attention, je vous présente, Monsieur, l'expression de mes meilleurs sentiments.

***

ii le 2 avril 1920.

Monsieur,

C'est avec plaisir que je rédigerais un article de 3000 à 5000 mots pour *Isis* et il serait préférable de le faire en anglais puisque je pourrais ainsi atteindre un public différent. Je le ferai traduire par un ami, puis le reverrai moi-même, pour m'assurer que le sens scientifique n'a pas été altéré. Quoique incapable de rédiger correctement en anglais, je comprends cette langue à fond et puis fort bien vérifier l'exactitude d'une traduction. Mais je ne puis vous fixer une date étant occupé actuellement à finir un travail.

Ma santé s'étant remise depuis un an, et le *T'oung Pao* se trouvant encombré de copie par suite des retards dûs à la guerre, j'ai profité de l'interruption de mes *Origines* pour commencer dans les *Archives* un résumé dont l'idée m'était suggérée par votre lettre du 27 novembre 1917. Je vous ai adressé le premier fascicule à Cambridge, Mass. où j'espère que vous l'avez bien reçu.

Par même courrier je vous adresse le 2e fascicule. Je prends aussi la liberté de vous signaler un article qui paraîtra dans le *Journal Asiatique* de janvier 1920 (en retard). Je suis heureux d'apprendre que vous avez repris la publication de votre revue. Je vais m'informer où je pourrai en trouver des exemplaires et s'il y a un dépôt à Paris ? Tout ce qui concerne l'histoire des connaissances humaines m'intéresse...

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(La lettre suivante est écrite par une autre main, qui me paraît être celle de Mme L. de S., mais est signée par lui).

iii Rossinière le 26 mai 1921.

Monsieur,

Ce n'est pas sans regrets que j'ai dû renoncer à écrire le résumé que vous aviez bien voulu me demander pour Isis. Mais depuis le mois de mars 1920 j'ai perdu comme je vous l'ai dit toute faculté de travail, c'est-à-dire que je ne puis plus ni lire, ni écrire, tout en restant capable de réfléchir et de préparer mes idées. Les articles que je vous ai envoyés avaient été rédigés antérieurement à cet état de choses. Le seul travail que j'ai réalisé est le petit article ci-inclus, que j'ai dû interrompre à cause des troubles de circulation, bourdonnements d'oreilles, etc., qu'il m'a provoqué.

Le travail publié dans les *Archives* en 5 fascicules, et dont vous avez, je crois, un exemplaire complet, vient de recevoir un prix de l'Académie des Inscriptions; et je vais présenter ce même travail à l'Académie des Sciences pour le prix annuel Binoux (histoire des sciences) en 1922. Comme le règlement de cette Académie demande que les auteurs présentent un résumé accompagnant leur travail, je vais avoir à composer ce raccourci et je pourrai vous l'envoyer pour *Isis* après l'avoir traduit en anglais. J'espère pouvoir faire cela dans le courant de l'été...

... Ne pouvant plus supporter le climat du lac, je suis fixé à Rossinière M.O.B. Vaud, Suisse, mais on peut aussi m'écrire par Genthod.

***

iv Rossinière (Vaud) Suisse, le 3 juillet 1922.

Cher Monsieur,

...Je n'ai pas oublié ma promesse de vous envoyer un résumé en anglais de mes études, mais j'ai plus de travail que ma santé ne me permet d'en exécuter et d'autre part je vois que, chaque année, mes idées se condensent mieux; de telle sorte que je ne regrette pas d'avoir attendu...

...Mon état de santé est maintenant *fixe*. Je dois rester au lit à perpétuité, sauf quelques heures après midi où je puis m'asseoir et travailler de mes mains, surtout scier du bois, ce qui me maintient physiquement. Impossibilité d'écrire ou de lire (ou d'écouter lire longuement) passé midi : — mais, le matin, je puis travailler en écrivant lentement; les lettres me fatiguent davantage car la pensée papillotte davantage.

Cet état provient de troubles de la circulation au cerveau provoqués par la moindre tension des perceptions intellectuelles. Et son origine provient d'un abus de la chasse et de la marche qui a ruiné mes nerfs vaso-moteurs des jambes.

Tout cela pour vous expliquer comment il m'est difficile de contribuer, comme je le désirais, à vos intéressantes et très utiles publications. Je puis produire, mais dans des conditions très limitées.

Veuillez croire, cher Monsieur, à mes sentiments de confraternité cordiale.

***

v Rossinière 10 juin 1923.

Cher Monsieur,

...Par suite de mon état de santé je ne puis malheureusement faire aucune lecture suivie, ni en écouter, parce que cela m'occasionne des troubles de la circulation au cerveau. Mais, petit à petit, en feuilletant, je vois dans chaque volume ce qui est à retenir et en prends connaissance progressivement. L'article sur le drapeau chinois, que vous avez bien voulu insérer, * ne répond plus

* (Il s'agit de l'article : « *La cosmologie chinoise à propos du nouveau drapeau chinois* » publié dans *Isis*, 5, 140-2, 1923).

exactement à ma pensée actuelle, comme vous le verrez dans l'article *Le système cosmologique sino-iranien* actuellement en cours d'impression dans le *Journal Asiatique*. Je crois d'ailleurs vous avoir envoyé mon article des *Archives*, janv. fév. sur *l'Origine babylonienne de l'astronomie chinoise* qui vous aura montré que j'ai renoncé à soutenir l'origine chinoise, depuis les échanges de vues que j'ai eus avec des iranistes allemands, lesquels ont, par ailleurs, reconnu la parenté chinoise du système iranien.

J'ai bien regretté que vous ayiez écrit (surtout sous la rubrique d'un article portant mon nom) une appréciation si dure du mémoire très savant de mon confrère G. FERRAND sur le *K'ouen Louen*. Je lui ai exprimé combien j'ai été peiné de ce jugement. Quoique ma thèse soit en opposition avec la sienne, je dois reconnaître que les deux opinions se concilient. L'étymologie cosmologique de *K'ouen Louen*—Atlas est confirmée, comme vous le verrez, par le cosmologie iranienne. Mais, d'autre part, il est incontestable, d'après la documentation exposée par FERRAND, que le terme (transformé en K'ouen Louen par les Chinois) a une réalité sous la forme Komr, Khmer chez ces peuples. FERRAND, sans connaître la signification cosmologique de K'ouen Louen a bien constaté que le nom des Monts K'ouen Louen avait dû influencer la transcription chinoise de ce mot indochinois. Par ailleurs la migration des insulaires de Java à Madagascar est avérée depuis longtemps.

Il y aurait donc deux faits distincts 1° Réalité d'un peuple Komr. 2° Concept cosmologique sino-irano-grec des confins du monde supportant la voûte du ciel. 3° Déformation du nom du peuple Komr dans la transcription chinoise, le système de l'écriture chinoise donnant involontairement une signification chinoise aux mots étrangers, et parfois volontairement par un calembour donnant un sens acceptable à cette transcription phonétique.

FERRAND restera le grand historien des relations entre les pays de l'Océan Indien. Il prépare une œuvre de grande envergure à ce sujet.

Depuis plusieurs semaines je désirais vous exposer cela, mais le peu de temps dont je dispose par suite de mon état de santé et de travaux pressés à terminer, m'en a empêché, ce dont vous voudrez bien m'excuser. J'ai prêté le volume d'Isis au professeur

HESS de Zurich qui prend grand intérêt aux articles arabisants y contenus.

Où en est votre Introduction ? A mon avis il ne faut pas la hâter. Il n'y a pas d'inconvénient à la garder plusieurs années encore en chantier. Un tel travail doit être modifié plusieurs fois avant d'être définitif.

Avec tous mes meilleurs remerciements, et mes compliments pour votre belle Revue, recevez, cher Monsieur, l'assurance de mes sentiments bien sympathiques et distingués.

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vi. *(Lettre écrite par la même main que la lettre* III*).*

Rossinière, le 3 février 1924.

Cher Monsieur SARTON,

Par suite de mon état et du peu d'heures où je peux travailler, le matin, je ne puis malheureusement pas entretenir la correspondance que je souhaiterais d'avoir régulièrement, mais j'ai bien souvent pensé à votre aimable lettre de l'an dernier et désire y répondre longuement. Étant en ce moment immobilisé par une indisposition, je ne puis la rechercher, mais me rappelle fort bien, sauf le nom, ce que vous m'avez dit de l'historien de la guerre du Canada, dont le travail était aussi limité par des troubles de circulation au cerveau.** Il en était de même, d'ailleurs de DARWIN dont le travail était limité, à deux heures, le matin.

Ce que vous m'avez dit de l'histoire de la guerre du Canada m'a particulièrement frappé, parce que je suis un grand admirateur de votre compatriote MAHAN, dont l'histoire navale *Influence of Sea Power upon History* est une révélation. Dans cette histoire, on voit aussi la lutte au Canada et je comprends que MAHAN a beaucoup emprunté dans l'explication des causes, à l'auteur dont vous me parliez.

J'ignorais que vous vous occupiez si spécialement de l'histoire de l'art chinois, domaine qui m'est d'ailleurs tout à fait étranger. Aussi je pense que vous aurez grand plaisir à vous entretenir

** (Je lui avais parlé du grand historien américain FRANCIS PARKMAN, 1823-1893). G. S.

avec PELLIOT qui, dans sa dernière lettre, m'annonçait qu'il partait pour une tournée de deux ou trois mois aux États-Unis.

En ce qui me concerne, mon champ d'études s'étend chaque année davantage dans toutes les directions. Comme vous avez pu le voir dans le *Journ. Asiat.* d'avril-juin 1922, je ne crois plus à l'origine babylonienne de la cosmologie chinoise, après l'avoir admise pendant quelques mois sous l'influence d'un iraniste allemand. Je vois au contraire que les concepts chinois se sont répandus à travers l'Asie, ont inspiré la mythologie grecque et l'Avesta. Cette forme iranienne se manifeste avec évidence dans l'Apocalypse comme je l'ai montré au Congrès d'Histoire des Religions dans un mémoire dont je vous enverrai un tiré à part.

Recevez, cher Monsieur SARTON, l'expression de mes sentiments les plus sympathiques et dévoués.

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vii. Hôtel Bellevue, Grasse, le 30 déc. 1924.
Adresse permanente : Genthod, Switzerland.

Cher Monsieur SARTON,

A l'occasion des fêtes de fin d'année et des devoirs épistolaires qu'elles entraînent, je me suis arraché au travail très accaparant auquel je suis attelé depuis des mois (sur la chronologie chinoise). Et je profite de mon beau zèle de correspondance pour vous présenter mes excuses les plus humbles et sincères sur mon silence prolongé. Dans votre aimable lettre, que je n'ai pas ici, reçue il y a plus de six mois, vous me parliez de la difficulté des débuts d'Isis, de la satisfaction que vous causait la fondation de la Société qui va assurer son avenir, et vous vouliez bien me demander un petit article (auquel j'ai songé souvent). Je n'étais pas pressé de le rédiger, pour la raison que, depuis deux ans, les nouveaux horizons découverts par l'apparition de l'identité sino-iranienne me faisaient entrevoir une solution au problème des origines : depuis deux ans (*Journal Asiatique* avril-juin 1923, le système cosmologique-sino-iranien) j'ai découvert l'étroite solidarité sino-iranienne laquelle a été immédiatement admise par les iranistes

allemands, et qui entraîne la solidarité indo-irano-chinoise. Or ces trois contrées sont précisément celles qui ont le mystérieux zodiaque lunaire sur lequel tant d'idées ont été sanctionnées par WHITNEY. Depuis dix ans les résistances que je rencontre chez les sinologues proviennent de leur arrière-pensée que l'astronomie chinoise vient de Babylone, à une date peu antique, et cette vue «perversely false» (comme dit WHITNEY à contre-sens) est enracinée chez eux par le fait que les Arabes ont aussi ce zodiaque lunaire censé provenir de Babylone. Or c'est là une immense mystification. La forme arabe n'est pas préislamique, elle a été empruntée aux Persans par les marins arabes du golfe Persique.

Comme d'autre part l'origine de ce très ancien système équatorial, cosmologique et astronomique ne peut être attribué à la Chine antique, j'inclinais à admettre qu'il a dû naître dans l'Inde vers l'an 4000 indiqué par divers repères astronomiques, mais une telle hypothèse se heurtait à des invraisemblances. Les nouvelles découvertes du Sind et du Pendjab viennent lever le voile d'une manière inattendue. Je viens d'envoyer au Journal de Genève un article à ce sujet. Je le complèterai, traduirai, et vous l'enverrai en janvier. Je crois que nous sommes à un *tournant* important des vues sur l'origine *des* civilisations.

Grâce à ma fille aînée qui m'a subitement amené un médecin de sa connaissance dans ma retraite alpestre où je dépérissais lentement, couché depuis des années, me voilà sur pied. Ce médecin m'a expédié aux eaux de *Lamalou* (Hérault) merveilleuses pour la locomotion quoique mal administrées et peu connues. J'y ai retrouvé mes jambes, je marche plusieurs kilomètres par jour et passe l'hiver au beau soleil de Provence. Comme il y a, dans ce même département des Alpes Maritimes, trois stations d'été à 1300 m. d'altitude, je ne retournerai plus en Suisse et vivrai à proximité de Lamalou où j'irai chaque automne.

Avec tous mes vœux pour la nouvelle année et le succès d'*Isis*, je vous adresse, cher Monsieur, mes pensées cordiales et sympathiques...

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(*Les deux dernières lettres ont été écrites par Madame* LÉOPOLD DE SAUSSURE).

viii. Château d'Oex, Vaud, 22 août (1925).

Monsieur,

Dans les papiers de mon mari, je viens de trouver une lettre de vous avec la mention : à répondre, écrite de sa main. Sachant le plaisir qu'il avait toujours à correspondre avec vous, je me permets de vous écrire pour vous annoncer sa mort survenue à Genève le 30 juillet.

Les eaux de Lamalou ne l'avaient qu'imparfaitement remis sur pied, c'est pourquoi nous avions vu la nécessité de le conduire en Suisse dans une clinique pour être observé par un médecin compétent. C'est là qu'il est mort après dix jours de souffrance, sans se rendre compte de la gravité de son état, ayant très vite perdu connaissance.

Recevez, Monsieur, l'expression de mes sentiments distingués.

MARTHE DE SAUSSURE

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ix. Vevey, Suisse, 8 Deux-Temples, le 19 février 1926.

Monsieur,

Au retour d'un voyage, j'ai trouvé votre aimable lettre ce qui explique le retard que j'apporte à y répondre.

Les études de mon mari étant très spéciales, il m'est difficile de vous indiquer quelqu'un qui pourrait en parler en connaissance de cause. Cependant un article nécrologique doit paraître sous peu dans le *Journal Asiatique* (dirigé par M. G. FERRAND, Paris) et un autre dans la revue le *T'oung Pao* (M. PAUL PELLIOT, Paris) et je crois que vous trouverez là les renseignements que vous désirez. Dès que ces périodiques auront paru je vous en ferai expédier un exemplaire.

Je ne possède pas de bonne photographie récente de mon mari mais vous en enverrai une déjà ancienne et vous verrez vous-même si elle peut être utilisée.

Veuillez agréer, Monsieur, avec ma reconnaissance pour toute la sympathie que vous me témoignez, l'expression de mes sentiments les meilleurs.

MARTHE DE SAUSSURE

The Great St. Bernard Pass and its Hospice

One of the romantic excursions in the high Alps is that to the lofty hospice on the bleak summit of the Great St-Bernard Pass. I have visited it twice in my Alpine rambles and my memories of the two nights I spent in this eyrie above the clouds are still vivid. After the Quarta Cantoniera di Santa Maria on the Stelvio route, which is forty-six feet higher, the hospice with its small band of monks and attendants is the highest year-round habitation in the Alps — 8114 feet. The higher Hotel Ferdinandshoehe on top of the Stelvio (9045) and the recently erected inn at Jungfraujoch (11340), a station on the spectacular cog-railway up and through the interior of the Jungfrau, the highest hotel and post-office in the world, are open only for a short time in summer. The night which I recently spent at the latter, high above the Aletsch Glacier, the largest in the Alps, was memorable for the view alone—a scene suggesting a glacier-filled valley of the Ice Age, but one utterly divorced from human associations.

The Great St. Bernard pass cuts the Pennine chain of the Western Alps, its long route of forty-nine miles extending from Martigny on the Upper Rhone to Aosta in Piedmont in Northwest Italy. The distance for walkers is generally shortened nearly a half by using the railway as far as Orsières, which is twelve miles up the Swiss ascent, and about as much more by taking advantage of short-cuts down the Italian slope. There are only two Alpine highways which exceed it in height, those over the Braulio (8220) at the eastern end of the Central Alps, and its branch the Stelvio, the latter famed as the highest auto-road in Europe. The pass is less noted for scenery than many others in the Alps, for most of the route over it is unattractive and sterile. But there is striking scenery along the road above Bourg-St-Pierre on the Swiss side, where one gets a magnificent view of the snowy summit

and glaciers of Mont Velan, and again from the top where the scene opens toward Italy down into the basin of the Vacherie, and still farther down at Condemine, five miles above Val d'Aosta, the Italian exit, where one enjoys another view of Mont Velan and of the Grand Combin.

Apart from its great attraction — the famous hospice which has rendered assistance to travelers for almost a millennium — it is one of the oldest pass-routes in the Alps. In LIVY's day the Alpis Pennina or Poenina, its ancient name, was known to the Romans as the pass of the Carthaginians or Poeni, since it was erroneously believed that HANNIBAL and his elephants traversed it in entering Italy in the fall of 218 B.C. But we now know that HANNIBAL did not cross it and that that honour belongs to some other as yet unidentified route through the Western Alps, the choice among scholars now being narrowed to three — the Mt. Genèvre (6100), its tributary the Col de Clapier (8173), and the Little St-Bernard (7179), with the weight of authority perhaps favouring the latter (1). We also know that the name Penninus came from that of the Celtic god Pen long worshipped on the summit, or rather that the god took his name from that of the pass since *pen* is Celtic for summit in Cornwall and Wales, *e.g.* Pendennis, Penmaenwaur, and, slightly changed into *ben*, in Scotland, *e.g.* Ben Nevis.

After the Celtic deity was supplanted by the Roman Jupiter, a temple to the latter was erected on the summit which gave the pass its Roman name *Mons Jovis* — a name surviving in Italian as *Monte Giove* and in local French as *Mont Joux*. Only after the fame of St-BERNARD, who founded the medieval hospice on its summit, had led to his canonization by the Church, was it called after him, the Great St-Bernard, to differentiate it from the neighboring Little St-Bernard, on which he also founded a hospice, a pass which cuts the Graian Alps farther south and connects the Tarantaise in the upper Isère valley in Savoy with Val d'Aosta at its southwestern corner. A mulepath over the pass was known to the Romans as early as the close of the second century B.C. (2).

(1) LIVY, *History of Rome*, Bk. 21, 38. On HANNIBAL's Pass, see W.W. HYDE, *Roman Alpine Routes*, Philadelphia, 1935, Excursus 1, 197-210.

(2) For references to the ancient history of the pass, see W.W. HYDE, *op. cit.*, 59 f.

A cache of Celtic, Greek and Sicilian-Punic coins, found at the base of a stone altar at the top, shows the Celts were in this part of the Alps as far back as the third century B.C. Certain articles of iron found on the pass have been assigned by some to the Early Iron Age, while bronze articles found in graves on the Swiss approach point to its use in the still earlier Bronze Age.

But the real history of the pass-route begins with AUGUSTUS' conquest in 26-25 B.C. of the Celtic tribe of the Salassi, who had long dwelt in Val d'Aosta. His legate, TERENTIUS VARRO destroyed the Salassian center, capturing 44 000 and selling 8000 into slavery at the neighboring town of Eporedia (Ivrea) (3). The valley was quickly Romanized and on the site of his legate's camp the founder of the Empire built a town — Augusta Praetoria. It was so well constructed that its modern representative, Aosta, not only retains its Roman name in slightly corrupted form, but also its shape and many of its monuments. The latter include walls, towers, a gateway whose two façades are pierced by three openings, a granary, a theatre, and in front of the main gate a triumphal arch ornamented with Corinthian columns in honour of AUGUSTUS. It became the seat of a bishop in the early seventh century and Englishmen will remember it as the birthplace in the eleventh century of ANSELM, the theologian and archbishop of Canterbury, and Frenchmen because it was the scene of JOHN CALVIN's flight in 1541. Long before this, ST-BERNARD of Savoy was its archdeacon. It was during his sojourn here that he had opportunities to talk with travelers from the north, and felt the need of founding the two refuges at the summits of the two passes which still bear his name.

There are many Roman remains along the pass-route. Pieces of pavement, probably surviving from the first road built over the pass by the emperor CLAUDIUS toward the middle of the first century, can be seen here and there on the way down the Swiss side to the Rhone, while on the summit, near a small lake, there is a stretch of road some 200 feet in length and 10 or more in

(3) See account of VARRO's conquest in DIO CASSIUS, *History of Rome*, Bk. 53, 25, 4-5 (CARY's Transl. in the Loeb Library, VI, 1919); CARLO PROMIS' essay, Le Antichità di Aosta in *Mem. della r. accad. delle Scienze di Torino*, Ser. I , 21, 1864, 1-207, Tav. 1-xiv; and F. FERRERO, *The Valley of Aosta*, London, 1910. pts. I-II, especially 119-134.

width hewn from the solid rock, apparently as a protection against the wind. On the tiny summit plateau — *le plan de Joux* — are still visible the foundations of a Roman refuge or *mansio*; of another building, perhaps a barrack; and of a temple of Jupiter laid bare by the Italian government, 1890-1894 (4). This temple had the distinction of being the highest in the Roman world. Near the lofty bronze statue of ST-BERNARD erected here in 1905 is a stone cross inscribed to Jupiter — *deo optimo maximo*. Ancient coins have been garnered over a long period by the monks in the little museum in the monastery building. Nearly 500 Celtic ones have been found in its neighborhood, but the largest number, over 1600, are Roman and range in date from *circa* 150 B.C. to the time of THEODOSIUS's sons, who died in A.D. 408 and 423 respectively. Moreover, some 30 inscribed votive offerings, mostly of metal, have been found in the ruins of temple and refuge. Some of these are marked with the number of a Roman legion, while others are inscribed *Jovi Poenino*. They date from the time of TIBERIUS in the early first century to the first barbarian invasions of the early fifth. These, like the coins, recall the well-known Roman custom of travelers leaving memorials to the deity for a safe crossing — *pietatis causa pro itu et reditu* (5). Temple and refuge seem to have endured at least to the time of THEODOSIUS THE GREAT, who died in 395, as ST-AUGUSTINE tells us it was he who destroyed all Alpine shrines. But they may have been destroyed by Huns and Vandals in the fifth century, and in any case they had disappeared by 574 when the Lombards crossed from Italy to attack ST-MAURICE on the Rhone.

During the Middle Ages (6) the Great St-Bernard was one of the chief transalpine arteries for all conditions of men — merchants, soldiers, pilgrims, ambassadors, emperors and popes. CHARLEMAGNE crossed it perhaps eight times between 774 and 801 and Pope LEO IX crossed it four times in the eleventh century.

(4) See Notizie degli Scavi (*Atti della r. accad. dei Lincei, Mem. della classe di scienze morali e filologiche*, Roma, 1891-4) : and *cf. Mem. della r. accad. di Torino*, Ser. II, 41, 1891, 331-87.

(5) See F. VON DUHN and E. FERRERO, Le monete galliche del medagliere dell' ospizio del Iran San Bernardo (*Mem. della r. accad. di Torino*, Ser. II, 41, 1891, 331-7). For votives, see *Corpus Inscript. Lat.*, V. 2, nos. 6863-94.

(6) For its medieval history, see especially J. E. TYLER, *The Alpine Passes in the Middle Ages* (962-1250), Oxford, 1930, 68-72.

The names of saints for towns and chapels all along the route —Oyen, Remigius (St-Remy), Bernard, Pierre, Jean, Laurent, Étienne and Notre-Dame de Lorette — attest its medieval importance. By the twelfth century its only rivals were the Septimer and the Brenner in the Central and Eastern Alps respectively. But the opening of the St-Gotthard route soon after 1200 injured it greatly, as this afforded a more direct route to Basel and the north. Since then the Great St-Bernard, like its sister, the Little St-Bernard, has remained largely a local pass.

The most famous modern traverse was that of NAPOLEON and his army of 36000 during the week of May 15-21, 1800, (7) even though the story of some of that fame is apocryphal. Painters have pictured the First Consul as crossing the eternal snows with all the pomp of war, at the head of his troops fully caparisoned and riding a white charger. Nothing could be further from the truth, for he wore his usual *surtout* and rode a mule in the rear of his last regiment to cross. The actual crossing of his troops was in charge of his generals MARMONT and JASSENDI. NAPOLEON himself followed with only three companions — his aide DUROC, his secretary BOURRIENNE, and a local peasant guide. With the latter he conversed and, learning that poverty prevented him from marrying his peasant sweetheart, later sent him a sum of money to buy a house and field, the first inkling the muleteer had of the importance of his charge.

NAPOLEON on his way up from Martigny lunched at Bourg-St-Pierre, eight miles below the summit. The unprepossessing inn ever since has borne the grandiose title, *Hôtel du Déjeuner de Napoléon Premier*. On my first walk over the pass, I stopped here and was allowed to sit in the arm-chair in which he had breakfasted, and later to order the same frugal meal of eggs, toast, and coffee! It was here that the old bridle-path ended and the army had sixteen miles yet to go over the pass before reaching the beginning of the Italian road at St-Remy. The path wound its way through the forest above the village, tortuous, steep and rocky. This is now avoided by the modern road which is hewn

(7) See M. THIERS, *Histoire du Consulat et de l'Empire*, I, Paris, 1845, 365 f. (actual crossing 375-377); and F. HEINEMANN, Der Uebergang NAPOLEONS I und der franzoesischen Armee ueber den St. Bernhard, *Neue Zuercher Zeitung*, 1900, 141-8.

along the precipices which overhang the savage defile through which the Drance reaches the valley. It was in this defile of Valsorey that his engeneers had great difficulty in transporting the cannon. These were dismounted and enclosed in hollow logs and dragged by ropes by half of a battalion, while the other half carried the arms and provisions of all. Similarly the gun-carriages and ammunition wagons were taken apart and placed on mules.

On reaching the hospice NAPOLEON stopped to pay his respects to the monks for having furnished his army with dinner. In gratitude he promised to place them in charge of the New Hospice which he was then planning to build on top of the Simplon Pass, but which was not completed till 1840, long after his death. That promise, however, was kept, and today Augustinian monks reign over the Simplon as they do over the Great St-Bernard. He glissaded like any tourist down the snow-slopes on parts of the Italian descent and spent the night at Étroubles, now a considerable village, having ridden his mule forty miles that day. On the next, he reached Aosta and soon thereafter his army stood before the supposably impregnable fortress of Bard, where a garrison of 400 Austrians checked him for eight days. How his generals MARMONT and BERTHIER got the army through the town at night, deadening the sound by littering the streets and binding the wheels of the gun-carriages with bands of hay is a romantic story. Only when the soldiers had hoisted a gun into the belfry of a church which commanded the chief gate of the fortress was the latter destroyed and the Austrians surrendered. Then NAPOLEON was ready for Marengo, fought June 14, one of his most brillant victories.

Despite his kindness to the monks, NAPOLEON's activities impoverished the hospice. During the Italian campaigns of 1798-1800 hundreds of thousands of French and Austrian soldiers had crossed the pass. In 1799 the French had fought a pitched battle with the Austrians in the pass, and after their victory had quartered 180 of their men in the hospice for a year. To give an army of 36000 men only one meal taxed the monks to the utmost. It is curious that after Marengo NAPOLEON began a military road over the Simplon which took six years to build at tremendous cost owing to huge difficulties on the Italian side,

rather than one over the Great St-Bernard, where he had encountered so much trouble with his artillery. That he thought the Simplon was better suited to his military plans is shown by the question he asked of the engineer who on one occasion came to him to report progress : *Le canon, quand pourra-t-il passer au Simplon?* Here is shown the key to his success through force, as we see it in dictators of our time. A modern road was not completed on the Swiss side of the pass till 1893, nor on the Italian, including the link aver the top, till two years later.

However, the chief attraction of the Great St-Bernard is not its military use, but the hospice which St-Bernard, the "Apostle of the Alps" built or restored on its summit centuries ago. We know curiously little about this courageous churchman (8). He was born of noble lineage at the château of Menthon at Menthon-St-Bernard, a tiny summer spa on the Lake of Annecy in Haute-Savoie. This castle ruin (9) still stands above the village, and the room is shown with the window through which tradition says BERNARD leaped to avoid marriage with the beautiful MARGUERITE DE MIOLANS, a bride chosen for him by his father, the event which caused his flight to Aosta, where he soon became archdeacon.

The very year of his birth and that of the founding of the hospice are still in dispute. The 1000th anniversary of the traditional date was celebrated by an encyclical of the present Pope PIUS XI in 1923, in which he was called "protector of Alpine climbers", to which hob-nailed fraternity His Holiness once belonged when in 1889 with LUIGI GRASSELLI he discovered the "RATTI" route up Monte Rosa from Macugnaga. Such a date fits into the traditional year of the founding of the hospice in 962 when he was 39 years old, as well as into the generally accepted date of his death in 1008 at 85. But recently these dates have been pushed forward nearly a century — 996-1081 — which would bring the foundation of the hospice between 1045 and 1049 (10). Whether an older

(8) Not to be confounded with ST-BERNARD of Clairvaux (1080-1153), one of the most famous preachers and monks of the Middle Ages. See R.S. STORRS, *Bernard of Clairvaux; the Times, the Man and his Work*, New York, 1893.

(9) See MUIRHEAD, *The French Alps* (Blue Guide Series), 2nd ed. 1926, 56.

(10) See J. A. DUC, À quelle date est mort SAINT BERNARD de Menthon *(Miscellanea di storia italiana*, XXXI, 341-368); followed by A SCHULTE, *Geschichte des mittelalterlichen Handels und Verkehrs zwischen Westdeutschland und Italien*, 1,

hospice preceded ST-BERNARD's on the summit — one built perhaps by CHARLEMAGNE's son, LOUIS LE DÉBONNAIRE (814-40), or by his uncle, BERNHARD, who led a part of his army over the pass in 773, or even by a second BERNHARD, son of PEPIN, made king of North Italy by his grandfather CHARLEMAGNE — cannot be determined. There is some evidence that there was a hospice even before 851 — though most records were destroyed in 890 by ARNAUD. Coincidence in name may even have decided ST-BERNARD to restore an older refuge. An earlier *Abbatia Montis Jovis Sancti Pietri* existed at Bourg-St-Pierre below the summit in the early ninth century. It was destroyed during the following century by Saracens, remnants of those who survived defeat at the hands of CHARLES MARTEL at Tours in 732, and who still retained some authority in the old French province of Languedoc.

After capturing Fraxinetum — Garde Fresnet on the Gulf of St-Tropez in Provence — towards the close of the ninth century some of these Saracen freebooters infested the passes of the Western and even of the Central Alps, exacting exorbitant tolls and massacring travelers for nearly a century until they were driven out from the Great St-Bernard pass in 972 by Count WILLIAM OF PROVENCE and his brother ROBALD. After they left the summit, a band of robbers made the ruins their headquarters. CANUTE, King of England and Denmark (995-1035), complained to the Emperor and Pope, and they also were driven out. We have contemporary accounts of the horrors of Saracen raids(11), and memories of their presence are found in place-names all over the Alps from Torre dei Sarazeni on the Riviera to Ponte Saraceno (Pontresina) in the Central Alps. While St-Peter's abbey was restored, its importance quickly waned with the restoration of the summit refuge.

The hospice appears from its records to have suffered calamities from barbarian traverses in the late eleventh century. Despite the contests between FREDERICK BARBAROSSA and Pope ALEXANDER III in the second half of the twelfth century, the safety of the

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Leipzig, 1900, 80-1; and W. A. B. COOLIDGE, *Swiss Travel and Swiss Guidebooks*, London, 1889, 156 and 192; and others.

(11) See E. OEHLMANN, Die Alpenpaesse im Mittelalter (*Jahrbuch fuer Schweizerische Geschichte*. III, 1878, 217).

monks was guaranteed by both, and this marks the beginning of their prosperity. As early as 1177 it is recorded that the hospice had in various dioceses 88 benefices in priories, cures, châteaux and farms. In the sixteenth century, because of changes in state-boundaries wrought by the Reformation and because of papal disputes the hospice gradually began to recede, and there has been no return of its former prosperity down to our time. In the middle of the last century even the ownership of the land on which it stands was a matter of dispute between VICTOR EMMANUEL II, last King of Sardinia and later the first of United Italy, who controlled the principality of Piedmont, and the Swiss canton of Valais which abutted on both Italy and France (Savoy) and claimed it was in the diocese of Sion guaranteed by bulls of LEO IX to BENEDICT XIV. It was then decided that the area as far as the middle of the lake and including the monastery buildings belonged to the latter. But still Sardinia demanded a tax for the use of the *Vacherie* or pasture just beyond the summit on the Italian side. A century ago, the hospice held little property beyond a vineyard at Clarens and a farm at La Roche (12). Today it still controlls a dependency at Martigny and collections are made for its upkeep among the Swiss cantons to supplement the revenue from travelers.

While ST-BERNARD dedicated the hospice to his favorite saint, NICOLAS OF MYRA, it has been called after him at least since 1125, when the name St-Bernard first appears in a document (13). Since the twelfth or early thirteenth century the monks have belonged to the Augustinian Order, while those in charge of the sister hospice on the Little St-Bernard pass now belong to the military and religious Order of Saints Maurice and Lazarus. The latter was long supported by Aosta, but now, like its neighbor, it is largely kept by charging visitors a regular tariff for entertainment. While in the Little St-Bernard there is only one resident monk with a few attendants — *marroniers* — those on the Great St-Bernard until recently numbered near a dozen monks with

(12) For the history of the convent and the life of the monks a century ago, see WILLIAM BROCKEDON, *Illustrations of the Passes of the Alps*, 1, 410, London, 1838 (with 109 engravings made in 1827-1829), 67-74.

(13) See R. REINHARD, *Paesse und Strassen in den Schweizer Alpen*, Luzern, 1903, 56-7.

half as many attendants. Under the changed conditions since 1925 so large a number is no longer needed. I have been recently informed that now many of the monks have left to take charge of a mountain refuge in India.

The present main building is said to date only from the middle of the sixteenth century, and its chapel from 1686. It is of massive stone construction, three storeys in height, well calculated to withstand the wintry blasts from the northeast and south-west. From other directions it is protected by Mt. Chénalette (9479) to the northwest, and Mt. Mort (9416) and Pointe de Barasson (9731) to the southeast. The ground floor is given over to stables and storerooms for hay, wood, wine and food. While the hay and food are brought up from Aosta, the wood comes from the forest of Ferret which opens into Val d'Entremont at Orsières four hours below. Twenty or more horses are kept busy all through the summer months in hauling enough wood to keep the monastery warm in winter. During the summer many cows are pastured in the Vacherie, but in winter all except one are driven down to Martigny. Stone steps, worn by the feet of monks and travelers for nearly four centuries, lead from the entrance up to the main floor, where a long corridor connects various rooms with the chapel at the western end. Here are the refectory, rooms for the monks, and a reception room, formerly used for guests, furnished with a piano, books and pictures. In an alcove is a small cabinet in which are displayed collections of plants, insects, and minerals from the neighborhood, and still more interesting, the relics of antiquity already mentioned. One of the monks serves as a guide and he is well informed about his treasures. He even discussed with me which pass was HANNIBAL's and favored the Little St-Bernard.

The chapel, whose only monument is a marble one set up by NAPOLEON in honor of his General DESAIX, who fell at Marengo, holds services early each morning and again in the evening. Many peasants from the neighboring chalets attend on Sundays during the summer. Here is a box attached to a pillar and marked *Offrandes pour l'Hospice* which long was the source of some of the funds collected for the expenses of the hospice. But it is a sad commentary on the lack of human generosity that while some 25000 travelers crossed the pass every year, only a fratcion

of the upkeep ever came from such donations. That is why the brothers were forced to turn the old Annex, the Hôtel St-Louis, which stands directly across the highway from the hospice with which it is connected by a covered overhead passage, into a real hotel and restaurant where regular tariffs are charged. This building, named in honor of the French kings whose protection often had been extended to the Order, was built early in the nineteenth century for the use of domestics and as a refuge in case of fire, from which the hospice had suffered twice. In 1898 it was enlarged to accomodate the summer overflow of guests from the main building, and in 1925 it was converted into an inn outright, and contains about seventy beds. For now only those *sans resources* are admitted to the monastery proper except in winter, when the Annex is closed. Those who arrive by private cars cannot remain overnight as formerly, in conformity with the ancient idea of a refuge for foot-travelers, and no one can stay a second night except in case of illness.

In their work of rescue the monks are assisted by their famous dogs, four or five of which only are kept the year round. Their endurance, resistance to cold, and sense of smell make them invaluable in tracking down those lost in the snow and in bringing first aid. But it is a misconception to imagine that the monks and their attendants scour the snow-fields searching for lost travelers. Instead, a servant and a dog are usually sent down to a lower refuge to guide those who have assembled there to cross the pass. Great numbers of Italian laborers cross in February, March and April to find work on the Swiss side, and these return by November. The *tourmentes* of winter raise the dry snow in clouds of dust which hide the path. Avalanches also are a source of danger mostly in the spring. Sometimes the rescuers themselves perish in an avalanche of snow. The records tell how, on December 17, 1825, a party of three *marroniers* with two dogs while returning with a traveler from the *Vacherie* was overwhelmed by an avalanche and all perished except one dog. The bodies were not recovered until the following summer. Again, on November 12, 1845, the commissar *(clavandier)* with three *marroniers* and their dogs all perished under a blanket of snow fifteen feet deep.

These heroic dogs, according to different traditions, are the

descendants of a cross either between the Newfoundland and Pyrenees breeds, or, less likely, between the Great Dane and mastiff. They are smaller than the St-Bernards which we know, which are descended from dogs introduced into England in 1860 and later. While the latter are red or orange with white spots and stand two and one-half feet at the shoulders, those which I saw at both St-Bernard hospices were smaller and were white with large tawny patches. (14) The breed is said to have been kept pure until 1812. In 1823 all the dogs were destroyed along with three attendants by a snow avalanche. Fortunately just before the accident a pair had been given away. These were recovered and thus the breed was kept up. The dogs rarely reach their ninth year before the rigors of the climate have crippled them with rheumatism and they have to be killed. Travelers found in the snow are given first aid and then brought into the hospice, where their frozen parts are rubbed with snow. If this treatment is not successful, one of the brothers who knows a little surgery must immediately amputate.

There is one more building of melancholy interest, small and low and with grated windows, situated near the eastern end of the monastery — the morgue, no longer, I think, open to visitors. Here the frozen dead are brought and laid out on a table in the position in which they were found, and covered with a shroud of linen. The body remains until a second is recovered, when the former one is placed upright against the wall, following the custom of many Latin monastic orders. Because of the cold it does not decay, but gradually withers. Thus the dead man's relatives can recognize him the following summer. If the body is not reclaimed the bones are finally laid away in a heap in a walled enclosure on one side. Here is an indiscriminate mass of bones, perhaps the collections of centuries. Any real burial is, of course, impossible amid the rocks with which the summit of the pass is strewn.

I have very different memories of my two visits to St-Bernard's. The first time, in August, 1912, I was accompanied by the poet JOHN FLETCHER. We reached the pass from the Swiss side on

(14) Description in *Encyclopedia Americana*, XXIV, 1927, 123-4; picture in *Encycl. Britannica*, VII, 14th ed. 1929, Pl. I, n° 8 (p. 496).

foot as we were making the famous eight day "Tour of Mont Blanc." We reached the hospice at dusk thoroughly drenched by a storm of sleet which had overtaken us during the last hour. Some twenty or more travelers, men and women, had already arrived by bus. After a plain supper in the refectory we assembled in the reception room, the only heated one in the monastery. Despite the polyglot character of the party, we found some with whom we could converse and so spent a most enjoyable evening. To look around one might have thought he was in a hotel parlor, rather than in a monastery over a mile and a half in the air. Later we were sent over to the Annex to sleep, though some were allowed to remain in the dormitories on the floor above furnished with 60 or 80 beds. After a "continental" breakfast next morning and after a visit to the chapel to make our donation the party separated, some departing by bus, we on foot for Aosta.

During my second visit fifteen years later, all was changed. I had walked up this time alone from Aosta and, on ringing the bell at the monastery porch, I was courteously directed to the Annex when the brother who answered the bell found I was not *sans resources*. The restaurant, with its array of tables and waitresses was very different from the long table in the refectory at which I had sat the preceding time with the abbot at the head and the brothers in their cassocks silently serving. The menu, I must admit, was fair enough, in fact far better than the simple fare which the brothers had dispensed. But the romance of the earlier visit was quite gone. My departure next morning by motor-cycle with a Dutch friend, whom I had met the night before, was thoroughly in keeping with the changed conditions. In little more than an hour we reached Martigny, a journey which would have required about eight hours on foot. We had little opportunity to enjoy the scenery as we had only flitting views of the hamlets through which we passed with our noisy machine.

In the novelty of spending a night at such a height and amid such solitude one is apt to forget how dreary life must be for the little band of devoted men who must spend eight or nine months of winter here when the hospice is inaccessible to tourists. For the wayfarers who then cross the pass are poor and ignorant, the cold intense, the snow six or seven feet deep and where

drifted against the convent thirty or more, as lines drawn across its walls indicate, and storms constantly swirl across the little plateau. Ice forms even in summer on the lake and it is recorded that once in 1816 — "the year without a summer" — it snowed every week. During a normal summer, the greatest heat is *circa* 68° Fahrenheit and in winter 29° below zero has been known, the annual mean temperature being 29°. Water boils at 190° instead of 220°.

The life of the brothers with its continuous round of religious duties, interspersed with dangerous attempts at rescue, must be dreary in the extreme. The library offers little relaxation beyond works on theology. The only form of amusement — and this has been made a part of their humanitarian work — is skiing. An Englishman left a pair of ski here in the winter of 1883 and the brothers rapidly grew proficient in the sport and are said even to have races. In fact Swiss skiing began on this bleak rock and it was not until six years later that it became a national sport. (15) Still the monks, through contact with travelers during the tourist season, have kept themselves well informed, despite the absence of newspapers and magazines. Their language, like that of many of the villages in Val d'Aosta, is French, as it is in the hospice on the Little St-Bernard. They begin their service as young men of eighteen to twenty, and rarely withstand more than fifteen years, when the rigors of their mountain home have undermined their health. Then they descend to the warmer climate of the dependency at Martigny, where they spend the remainder of their lives. There have been exceptions to this brief length of service. ST-BERNARD himself is traditionally said to have been in charge of the refuge on the Great St-Bernard for over forty years till his death, though of course this does not mean that he lived there all that time. In the last century Father BARRAS, after twenty-five years of service, was transferred as prior to the less exposed Simplon hospice.

It was in the summer of 1816 that Lord BYRON, while on a yachting cruise on Lake Geneva with the poet SHELLY, visited Clarens just before completing the third canto of *Childe Harold.* Annoyed at a woodland around the château "long cut down by

(15) See *Encycl. Brit.*, 14th ed., 10, p. 749.

the brutal selfishness of the monks of the Great St-Bernard" to be converted into a vineyard, he uttered a sneer at "the miserable drones of an execrable superstition" (16). Only those who have visited the monastery amid the eternal snows and learned of the heroic lives of the monks can fully appreciate the disgrace of such an utterance. For we can feel only the deepest reverence for this devoted band of religionists who willingly dedicate the best years of their manhood to the cause of mercy without earthly reward.

University of Pennsylvania. WALTER WOODHURN HYDE
Philadelphia, Pa.

(16) Note 22 to stanza XCIX in reference to the invocation to "sweet Clarens, birthplace of deep Love". See *The Works of the Right Honorable Lord Byron*, 1-8, Philadelphia, 1825, 1 (to p. 106). The sneer is rightly omitted from the Cambridge *Byron's Complete Poetical Works*, 1925, The 3rd canto was finished at Ouchy, June 27-29, and published Nov. 18, 1816.

Notes and Correspondence

Anfrage 69.—**A. de Stourdza (Sturza)**? Nach dem Tode CH. W. HUFELANDS erschien eine Broschüre von A. DE STOURDZA „C. W. H., esquisse de sa vie et de sa mort chrétiennes," Berlin, 1837. STOURDZA [richtiger STURZA] soll HUFELANDS Schwiegersohn gewesen sein. Ich bitte um folgende Auskünfte: 1. Wer war STURZA? Mit welcher Tochter HUFELANDS war er verheiratet? Evtl. Einzelheiten über die Ehe, Kinder aus dieser Ehe u.s.w. 2. Existiert STURZA's Broschüre in einer der grösseren deutschen Bibliotheken? Bibliographische Angaben über dieselbe. (Evtl. Unkosten werden gerne vergütet.)

Prof. DR. V. BOLOGA,
Cluj (Rumänien), Strada Pasteur, 6.

Question no. 70.—Algèbre chinoise. Les *Annales Officielles* des Song, dans la section biographique, parlent d'un président du bureau astronomique : TCH'ÊN HOUO (1002-1075).

Il a laissé un ouvrage intitulé *Propos de Monghsia.*

On y trouve, *en écriture chinoise ordinaire*, une règle qui s'écrirait en formule moderne :

$$\text{aire} = \text{corde} \times 2\,\frac{\text{flèche}^2}{\text{diamètre}}.$$

Dans les *Biographies des Mathématiciens*, YUAN YUAN pense que c'est de cette formule que, deux siècles plus tard, l'astronome KOUO CHEOU-KING * (1231-1316) déduisit ses formules contenant une équation du 4e degré :

$$d^2\left(\frac{a}{2}\right)^2 - d^3x - (d^2 - ad)x^2 + x^4 = 0.$$

(a = arc, d = diamètre, x = hauteur du segment).

A ce moment, c'-à-d. au XIIIe siècle, les Arabes étaient venus en Chine et y exerçaient une grande influence scientifique.

Quel est le degré d'approximation?

Y a-t-il des analogies?

L. VAN HÉE, S. I.

* SARTON'S *Introduction* (2,1022).

Query no. 71.—*Green flash in Greek and Latin literature.* Je serais très heureux si vous pouviez me dire si vous avez quelques références des auteurs anciens grecs, latins ou autres concernant le phénomène observé facilement le soir au coucher du soleil sur la mer et dénommé « rayon vert ». Il s'agit d'une lueur verte intense qui se produit exactement au moment où le soleil entre dans les flots à l'horizon. Si le ciel est un peu opaque au-dessus de cet horizon, mais qu'il y ait cependant une ligne assez large de ciel bleu et clair entre l'horizon de la mer et ce début de nuage plus élevé, le phénomène est encore plus intense, comme j'ai pu le voir tout ce mois à Hendaye où je me trouvais en vacances !

Ce rayon vert est de la couleur du cuivre en fusion lorsque le métal brûle par suite d'un excès de chaleur dans le creuset. C'est donc un vert très vif.

Il est certain que les anciens ont pu tout comme moi constater ce phénomène auquel je n'accordais pas une croyance absolue autrefois. La question nous ayant été posée je serais très heureux d'avoir recours à votre documentation, au besoin en vous priant de passer ma demande dans *Isis* si vous le jugiez utile. Un poète comme HOMÈRE ou VIRGILE n'aurait pas manqué, il semble de faire quelques jolis vers sur ce phénomène au même titre que pour les comètes par exemple ainsi que cela existe déjà on le sait.

(Bois-Colombes) R. TOUSSAINT.

Antwort no. 3 auf Anfrage no. 48.—Weitere Angaben über André Etienne. (Siehe *Isis*, 67, pag. 102 u. 114-118.)

I. Eintragung im Standesregister der römisch-katholischen Kathedrale zu Cluj (Klausenburg, Kolozsvárr, Siebenbürgen). In der „Matricula Mortuorum Ecclesiae Claudiopolitanae" findet sich in der Rubrik „Aprilis 1797" folgende Eintragung :

Dies mortis : 20*a*. Dies sepulturae : 22*a*. Sepeliens Parochus [Nicolaus Nagy]. Sp[ectabilissimus] D[ominus] Andreas Etienne, Chemiae professor p[ublicus] o[rdinarius]. Aetas : 48 ann. Locus : Ad cincturam templi. Leider finden sich keine anderen Angaben; es fehlen Geburtsort, Angehörige, etc. Die „cinctura templi" ist der Friedhof für die Adligen und Honoratioren, rund um die Scr. Michaelskathedrale, der schon längst aufgelassen und in einen Park umgewandelt wurde, heute Piatza Unirii benannt. Von Grab und Grabstein ist folglich keine Spur mehr zu finden. Sonst fand ich in den Kirchenbüchern keine Aufzeichnungen über ETIENNE, was ja leicht erklärlich ist, da ETIENNE nur wenige Jahre in Klausenburg gelebt hat.

II. In einer kurzen Notiz in der in Cluj erscheinenden ungarischen

medizinischen Zeitschrift „Orvosi Szemle," VIII, 1936, no. 2, pag. 65, betitelt „Az orvos-sebészi tanintézet" [Die med. chir. Lehranstalt zu Klausenburg], giebt der siebenbürgisch-madjarische Medizinhistoriker Dr. JENÖ PATAKI folgende Nachricht über ETIENNE:

„Über die Ernennung ETIENNES [zum Professor an der genannten Lehranstalt] erfahren wir einiges aus dem Brief des Dr. SAMUEL PATAKI, geschrieben am 1. Dezember 1793 an seinen in Ofen studierenden Sohn: „ETIENNE hat schon seine Vorlesungen an der Akademie begonnen. Er lehrt Mineralogie. Man sagt, er sei sehr lächerlich, weil er des Lateinischen gar nicht mächtig ist. Er schwitzt, wenn er etwas sagen muss, die Piaristen unterbrechen ihn und helfen ihm so. Dort sind nämlich [als Studenten] ausser einigen jungen Herren auch Piaristen. Solche Professoren schickt man uns also her." Aus diesen Zeilen geht klar hervor, dass seine Ernennung 1793 geschehen sein muss."

Ich möchte hinzufügen, dass, nach seinem Buch „Elementa Chymiae" zu urteilen, es mit ETIENNES lateinischen Sprachkenntnissen doch nicht so schwach gewesen zu sein scheint. Die „invidia collegialis" dürfte bei diesem absprechenden Urteil wohl eine Rolle gespielt haben.

III. Der bekannte Budapester Historiker und Bibliograph, Herr Dr. ENDRE VERESS hat die Freundlichkeit gehabt, auf meine Anfrage hin mir über die in der Budapester Akademie-Bibliothek und im Budapester National-Museum befindlichen zwei Exemplare der „Elementa" folgendes brieflich mitzuteilen:

„Das in Klausenburg gedruckte Buch gehört zu denjenigen, die ohne Titelblatt erschienen sind [sine pagina tituli impressa]; das heisst, besser gesagt, sein Titel hätte nach Drucklegung auch des zweiten Bandes, — welcher aber niemals erschienen ist, — gedruckt werden sollen. Diesen Eindruck habe ich von dem im National-Museum [vom alten SZINNYEI zitierten] Exemplar, welches hieher aus der Bibliothek des Barons WOFLFGANG KEMÉNYI gelangt ist und folgendes, handgeschriebenes Titelblatt hat:

ANDREAE ETIENNE Philosophiae ac Medicinae Doctoris, publici ac ordinarii Transilvaniae Chymiae metallurgicae professoris Elementa chymica etc. Tomus I. cui finito tome II. de genuina Metallurgia tractante et adhuc sub proelo typographico existente 1° appendix de aquarum Transilvaniae mineralium explorandum methodo facillime tractans; 2° praefatio et 3° rerum contentarum index adnectetur.

Claudiopoli, 20 Martii 1795.

... Nach SZINNYEI soll das Buch 1794 erschienen sein und dasselbe finde ich auf dem Katalogzettel zum Exemplar aus unserer Akademie-

bibliothek... Soweit ich die ungarischen Bibliographien kenne, findet sich sonst nichts in unserer Literatur..."

Cluj, (Rumänien), Institut für Gesch. d. Medizin.

VALERIU L. BOLOGA.

Answer to Query no. 63.—Early editions of the Deutsche Sphaera of Conrad of Megenberg (*Isis* 25, 455).

Der Zufall spielte mir Ihre in der *Isis* veröffentlichte Rundfrage nach der *Deutschen Sphaera* in die Hände. Da ich mit der Geschichte der mittelalterlichen deutschen Astronomie beschäftigt bin, ging ich jetzt der Ausgabe von KONRAD HEYNFOGEL nach.

Die Ausgabe "Nürnberg 1516" habe ich bisher nicht gefunden. Ich suche durch das Berliner Auskunftsbureau der Deutschen Bibliotheken weiter.

Die Ausgabe "Köln 1519" ist in der Münchener Staatsbibliothek unter der Bezeichnung : 4° Astr. U 160/5 vorhanden. Das Buch wurde für mich an die Leipziger Universitäts-Bibliothek geschickt, und ich habe es verglichen mit KONRADS VON MEGENBERG *Deutscher Sphaera*, herausgegeben von OTTO MATTHAEI (Berlin 1912). Das Ergebnis lautet : HEYNFOGEL hat die Übersetzung KONRADS VON MEGENBERG gekannt und benutzt. Aber die Übersetzung HEYNFOGELS lehnt sich durchweg eng an den lateinischen Text des SACROBOSCO an und weicht deshalb an unzähligen Stellen im einzelnen und in grösseren zusammenhängenden Abschnitten ab von der 1912 veröffentlichten Übersetzung. Ausserdem hat HEYNFOGEL selbständig jedes der vier "Hauptstücke" sinngemäss in eine Reihe von Kapiteln mit eigenen Überschriften zerlegt.

Der Kölner Druck 1519 umfasst 7 Quartbogen A-G = 28 Blatt = 56 Seiten, die nicht mit Seitenzahlen versehen sind. Seite 1 ist die Titelseite, Seite 55 enthält den Druckvermerk, Seite 56 ist leer. Der Satzspiegel ist in der Regel etwa 11 cm. breit und 16.7 cm hoch. Der Rahmen des Titels umspannt etwa 12 × 17.8 cm.

Ich habe die ersten fünf und die letzten sechs bedruckten Seiten des Buchs für Sie photokopieren lassen, den Titel nur wenig verkleinert, die andern Seiten zu je zwei auf ein Blatt. Der eigentliche Text der *Sphaera* des SACROBOSCO beginnt fol. A 11^r = pag. 3 unten und endet fol. G 11^v = pag. 52. Das übrige sind Zutaten HEYNFOGELS.

Die Probeseiten werden zum Vergleich mit dem Druck MATTHAEIS genügen. Schon der letzte Absatz fol. G 11^v = pag. 52 zeigt, verglichen mit MATTHAEI, pag. 45, 13 ff., die Selbständigkeit HEYNFOGELS.

JOS. DIEMER's *Kleine Beiträge* erschienen 1851 in den Sitzungs-Berichten der Wiener Akademie der Wissenschaften, philos. -hist. Klasse, vol. 6 und vol. 7 (später dann gesammelt in Buchform). DIEMER fasst

in vol. 7, pag. 82 sein Urteil über HEYNFOGEL so zusammen "Ich fand... dass der eigentliche Text des Buches [HEYNFOGEL's] selbst beinahe von

Sphera materialis.
gereuscht durch meyster Conradt
Heynfogel von Nuremberg' ern anfanck oder fun
dament der ghenen die da lüst haben zü der
kunst der Astronomy.

Printed Köln 1519.
(copy in Münchener Staatsbibliothek)

Wort zu Wort mit dem alten handschriftenlichen [= Handschrift C bei MATTHAEI] zusammenstimmt." DIEMER hat nicht umfangreich genug verglichen, und weder FRANZ PFEIFFER (1861) noch OTTO MATTHAEI (1912) scheinen HEYNFOGELS Ausgabe in der Hand gehabt zu haben (vergl. MATTHAEI, pag. XII, Anmerkung 1) : sie übernehmen DIEMERS Urteil.

(Leipzig) HERBERT NOLL-HUSUM.

The Edgar Fahs Smith Memorial Collection in the History of Chemistry.—The Edgar Fahs Smith Memorial Collection in the History of Chemistry, situated at the University of Pennsylvania, has received from Mrs. MARGIE A. SMITH, the widow of EDGAR F. SMITH, a gift of $ 50,000.00 for an endowment fund for its maintainance and development. The collection was assembled by Dr. SMITH, Professor of Chemistry, Chancellor of the University and Foundation Member of the History of Science Society (1). After his death in 1928 Mrs. SMITH presented it to the University; she has now taken steps to insure that it will continue increasingly to benefit students and to serve the needs of scholars.

The original gift comprised 7,000 items, old books on chemistry and alchemy, books on the history of chemistry, pamphlets, reprints, etc., as well as additional autograph letters, medals, portraits, and other historical documents. The collection has grown through gifts, and now contains more than 10,000 items. It has occupied the room which Professor SMITH occupied as an office, but it has outgrown its quarters and will soon be housed in the new chemistry building which the University of Pennsylvania plans shortly to erect.

The collection is available for the use of scholars. Arrangements may be made for procuring photostat copies or photographs of material which it contains, and reference work is also available through the librarian. Gifts are solicited of reprints on the history of science, including chemistry, physics, mineralogy and early medicine, as well as books and other material on the subject. Such gifts will be acknowledged, supplied with bookplates bearing the names of the donors, catalogued, and at once made accessible to students. Correspondence relative to the collection should be addressed to the Curator, Edgar Fahs Smith Memorial Collection, Harrison Laboratory of Chemistry, University of Pennsylvania, Philadelphia, Pennsylvania, U. S. A.

T. L. D.

The Terminology of Science in China.—In the past few years the Ministry of Education has promulgated a series of standard Chinese terms with which to render the technicalities of certain highly specialized sciences. The actual work of deciding on the desired equivalents has been undertaken by small committees of specialists in each field under the auspices of the National Translation Bureau (Kuo-li Pien-i Kuan). Some of the more common scientific terms had previously been borrowed

(1) CHARLES ALBERT BROWNE: EDGAR FAHS SMITH (1854-1928), *Isis* (vol. 11, 375-84, portrait, 1928).

from Japan or had been improvised by scholars associated with the Kiangnan Arsenal or with the College of Interpreters (I-hsüeh Kuan) at Peking a generation ago. The present efforts to standardize all the more important scientific terms represent the culmination of many years of sporadic and partially successful attempts. Brief mention of a few works showing the results of these efforts will give some conception of the progress that has been made. In the interest of clarity the titles are first listed by their arbitrary English renderings:

Principles to be Observed in Fixing the Terminology of Chemistry (*Hua-hsüeh ming-tz'ŭ yüan-tsê*). This work was sanctioned by the Ministry of Education in November 1932, and published in the following year. No attempt is here made to establish Chinese equivalents for all terms in this field; the terms for the 92 elements are fixed, and principles are laid down for possible future combinations. The well-known missionary, Dr. W. A. P. MARTIN (1827-1916), who reached China in 1850, is usually designated, with some degree of credibility, as the inventor of the present-day Chinese term for chemistry, *hua-hsüeh*, "the study of transformations." In 1839 a Japanese scholar, UDAGAWA YOAN, translating a Dutch version of a treatise on chemistry by WILLIAM HENRY (1774-1836), rendered the word by the Dutch sound, *chemie*. And this term was still in use in Japan in 1869, being employed in an address given at the opening of an official Chemical Bureau in that year. But early in 1870, as Dr. SHIO SAKANISHI points out, the present term *Kagaku* (the Chinese *hua-hsüeh*) appears in the title, *Kagaku kunmo* (An Introduction to Chemistry) by ICHIGURO CHUTOKU (1845-).

Technical Terms in Physics (*Wu-li hsüeh ming-tz'ŭ*), promulgated by the Ministry of Education in January 1934, and printed in the same year. In this work 8,206 English terms are assigned Chinese equivalents. The first efforts to standardize terms in this field began in 1908. Various organizations resumed the work in 1920, and again in 1927, but with only partial success.

Technical Terms in Astronomy (*T'ien-wên hsüeh ming-tz'ŭ*), promulgated by the Ministry of Education in April 1933 and printed in January of the following year. Some 1324 astronomical terms are given English, German, French, Japanese, and Chinese equivalents. There are similar comparative renderings for the various constellations.

Technical Terms in Materia Medica (*Yao-hsüeh ming-tz'ŭ*), promulgated by the Ministry of Education in November 1932 and published in November 1933. More than 1,850 terms are given Chinese equivalents, with parallel renderings in Latin, German, English, French, and Japanese.

The task of deciding on suitable Chinese equivalents for terms in the physical sciences is difficult enough, but the problem becomes

more serious in the social sciences where abstractions are more numerous and where subtle feeling elements are likely to enter in to distort reference. Just how serious this language difficulty can be is well brought out in Mr. I. A. RICHARDS' recent book, " Basic in Teaching, East and West." (1)

(Library of Congress.) ARTHUR W. HUMMEL.

Extreme slowness of the introduction of elementary algebraic symbols.—As a footnote to FLORIAN CAJORI's *History of mathematical notations* (2 vols., Chicago 1928-29; *Isis* 12, 332-36; 13, 129-30), it is worthwhile to remark that as late as 1731 when STEPHEN HALES brought out the second edition of his *Vegetable Staticks* (under the new title *Statical essays*, vol. 1) he found it necessary to explain the meaning of the symbols of equality, addition, multiplication and division. This may seem incredible, especially if one considers that HALES' great book bearing NEWTON's *imprimatur*, (2) was a very austere treatise, written not for the general reader, but for his fellows of the Royal Society and other men of science.

Here is the relevant text (Preface, p. viii) : " Whereas some complain that they do not understand the signification of those short signs or characters, which are here made use of in many of the calculations, and which are usual in *Algebra*; this mark + signifies *more*, or *to be added to*. Thus page 18, line 4, 6 *ounces* + 240 *grains*, is as much as to say 6 *ounces more* by, or *to be added to* 240 *grains*. And in line 16, of the same page, this mark × or cross signifies *multiplied by*; the two short parallel lines signify *equal to*; thus 1820 × 4 = 7280 : 1, is as much as to say, 1820 *multiplied by* 4 *equal to* 7280 *is to* 1."

GEORGE SARTON.

Leiden, Netherlands.—Institute for the history of medicine, natural sciences and mathematics.—The Leiden Institute was founded in 1928. The first director was Dr. JAN GERARD DE LINT (born near Breda in 1867). Dr. DE LINT, well known for his studies on the history of anatomy, died on Sept. 15, 1936. His successor is Dr. F. W. T. HUNGER, whose investigations of the Herbal of pseudo-APULEIUS were recently published (Leiden, 1935, see *Isis* 27, 96-98). We wish Dr. HUNGER every success for himself and even more so for the Institute intrusted to his guidance. G. S.

(1) Reprinted with the author's permission from the *Report of the Librarian of Congress for the year* 1935-36 (pp. 178-9, Washington 1936).

(2) Feb. 16, 1726-27 Imprimatur ISAAC NEWTON, Pr. Reg. Soc.

University of Cambridge.—The Faculty Boards of Biology A and B were authorized to set up a Committee to arrange for History of Science Lectures during the Michaelmas and Lent Terms of the Academic Year. The members of the Committee are: Dr. JOSEPH NEEDHAM (Chairman), Mr. J. D. BERNAL, Mr. H. BUTTERFIELD, Prof. F. M. CORNFORD, Sir WILLIAM DAMPIER, Prof. H. A. HARRIS, Mr. M. POSTAN, Prof. R. C. PUNNETT, Dr. HAMSHAW THOMAS, Dr. WALTER PAGEL (Hon. Secretary).

A course of 8 lectures was given during the *Michaelmas Term*, 1936 on "Modern Developments of Science 1895-1936":

(1) and (2) Lord RUTHERFORD, Physics;

(3) Sir A. S. EDDINGTON, Astronomy;

(4) Dr. A. W. ASTON, Atomic Theory;

(5) Prof. G. H. F. NUTTALL, Tropical Medicine and Parasitology;

(6) Prof. J. A. RYLE, Medicine (PAWLOW, BEAUMONT and the later development of gastric physiology and pathology);

(7) Prof. W. L. BRAGG, Crystal Physics;

(8) Prof. J. B. S. HALDANE, Genetics.

In the same term a *Seminar* on History of Science and Medicine was held by Dr. W. PAGEL and the following papers were read and discussed:

(1) Greek Medicine and scientific thought and the dawn of modern Medicine and Science (W. PAGEL);

(2) History of the Concept of Energy (R. L. M. SYNGE, Trinity);

(3) History of the Concept of Time (G. C. STALKER, St. John's);

(4) CASSIRER'S Views on Philosophy of Science (H. H. WOLFF, Peterhouse);

(5) Ancient and modern Mathematics (K. HIRSCH, Kings);

(6) Mechanism and Vitalism (F. P. SALBZURG, Fitzwilliam House);

(7) Sociological background of the XIXth Century Science, particul. Biology (HUMPHREY, Trinity).

During the *Lent Term* 1937 the following lectures were given:

(1) A Survey of the History of Science from ARISTOTLE to GALILEO, Sir WM. DAMPIER

(2) Biology from GALEN to MALPIGHI, Dr. JOSEPH NEEDHAM

(3) The Alchemists and BOYLE, Mr. J. D. BERNAL

(4) Astronomy from 1700, Prof. Sir A. S. EDDINGTON

(5) Philosophical Biology from LINNAEUS to DARWIN, Dr. H. H. THOMAS

(6) The Chemical Revolution in the Eighteenth Century, Dr. DOUGLAS MCKIE

(7) The Darwinian Period, Prof. PUNNETT

(8) FRANKLIN and FARADAY, Prof. A. FERGUSON.

The *History of Science Seminar* included the following meetings;

Mathematical problems past and present, Dr. HIRSCH

The value of historical studies for present-day biology and medicine, Dr. PAGEL

PARACELSUS as a prophetic thinker, Dr. PAGEL

Past and present theories of the nature of light, Dr. HIRSCHLAFF.

Editorial board of Isis.—Dr. SANFORD V. LARKEY has been obliged to resign his associate editorship (medicine) because of the increase of his activities in the Johns Hopkins Medical School and the Welch Medical Library. We hope that this will not prevent him from contributing occasionally to *Isis*.

Two new members have been added to our board in February 1937, to wit Prof. CONWAY ZIRKLE of Philadelphia for *Botany* and Prof. A. M. ASHLEY-MONTAGU of New York for *Anthropology*.

CONWAY ZIRKLE was born in Richmond, Virginia in 1895. He received his B. S. and M. S. degrees from the University of Virginia (1921), a Ph. D. from Johns Hopkins (1925), and did some graduate work at the University of London (Kings College) and the University of Geneva. He held a National Research Fellowship at Harvard and came to the University of Pennsylvania in 1930 as an Associate Professor of Botany. When the Morris Arboretum was given to the Department of Botany he became the Geneticist. Most of his technical papers have been in cytology, particularly in the field of the chemistry of cytological methods.

He has written many papers on the history of botany and biology, mainly:

1. Some forgotten records of hybridization and sex in plants, 1716-1739. *Journal of heredity*, 23, 432-48, 3 port., Washington, 1932 (*Isis* 21, 218-20).

2. More records of plant hybridization before KOELREUTER. *Journal of heredity*, 25, 18 p., 3 fig., 1934 (*Isis* 22, 605).

3. The inheritance of acquired characters and the provisional hypothesis of pangenesis. *American naturalist*, 69, 417-45, 1935 (*Isis* 25, 286).

4. The beginnings of plant hybridization, xiii + 231 p., 8 pl., Philadelphia, University of Pennsylvania Press 1935. (*Isis* 25, 507).

5. Animals impregnated by the wind (*Isis* 25, 95-130, 1936).

MONTAGUE FRANCIS ASHLEY-MONTAGU was born in London in 1905. He was educated in the universities of Cambridge, London, Florence, and in Columbia University, New York. His chief studies lay in the field of the comparative morphology of the primates, problems of animal

growth, human and comparative anatomy, physical anthropology, and cultural anthropology. In each of these fields he has published a number of papers. Anthropology he regards as the complete study of man in his physical and cultural relationships, and in every one of these relationships he is deeply interested. Since 1931 he has been Assistant-Professor of Anatomy at New York University, and since 1933 Lecturer in Physical Anthropology in the Graduate School at the same University.

In 1929 he was a Curator at the Wellcome Historical Medical Museum, and his interest in the History of Science received a strong addition of forces from the experience gained there. He is at present engaged on a biographical study of the father of English Comparative Anatomy, EDWARD TYSON, and is collecting materials for many other studies in the History of Science.

Professor ZIRKLE and Professor ASHLEY-MONTAGU are very welcome in the little *Isis* group. I look forward to many years of fruitful coöperation with them.

GEORGE SARTON.

Personalia.—*(News pertinent to this section should be sent directly to Mr.* L. GUINET, 11, *Place Général Meiser, Brussels, Belgium).*

Professor CHARLES HOMER HASKINS died in Cambridge, Mass., after a very long illness, on May 14, 1937. He was a foreign associate of the Académie des inscriptions and a member of many other academies. He had been an associate editor of *Isis* since 1924. A biography of him by LYNN THORNDIKE will appear in *Isis*.

Reviews

Epiphanius.—*Treatise on weights and measures.* The Syriac version. Edited by JAMES ELMER DEAN. With a foreword by MARTIN SPRENGLING. xv + 145 p. (Oriental Institute of the University of Chicago, Studies in ancient oriental civilization, no. 11.) University of Chicago Press, 1935.

Not so long ago (*Isis* 24, 127-29, 1935) it was my privilege to draw attention to BLAKE and DE VIS' Georgian-Armenian-Coptic edition of EPIPHANIOS *De gemmis*. On that occasion I corrected an omission of my *Introduction* (vol. 1, 362). I had forgotten to mention among EPIPHANIOS's works his treatise on weights and measures. That very treatise is now presented to us in a handsome Syriac edition, together with an English translation, an introduction and a learned yet breezy preface by MARTIN SPRENGLING.

The Greek text exists only in fragments, but the whole treatise is available in Syriac, being represented by two British Museum MSS. The earliest of these (middle of the seventh century) is reproduced in facsimile, and that reproduction is followed by a collation with the other manuscript (ninth century), the fragments, and LAGARDE's edition. Indeed the Syriac text had been edited as early as 1880 by PAUL ANTON DE LAGARDE (1827-91), but unfortunately in Hebrew type and not too carefully (*Veteris Testamenti ab Origene recensiti fragmenta apud Syros servata quinque*, Gottingae 1880).

The title of the original Greek text is unknown. Perhaps it was *περὶ μέτρων καὶ σταθμῶν* as the tradition would suggest. If so, it was misleading, for EPIPHANIOS' treatise, poor as it was, was more ambitious ; it was in fact a sort of archaeological introduction to the Bible.

It is divided as follows :

Introduction. Signs used in the Scriptures; Why, how, and when the Greek translations were made; The Septuagint, AQUILA; SYMMACHUS; THEODOTION; The fifth and sixth translations; ORIGEN's edition of the combined texts.

Measures. Of capacity; Of weight, including coinage; Of capacity, local usages; Of area and length.

Concerning names of places, in part. Individual sites; The quarters of the heavens; The geography of Palestine; The stars; Geographic terms.

The part on weights and measures was not a novelty. " As early

as A. D. 200 GALEN, a Greek physician, often made mention of ' those writing on weights and measures.' DARDANIUS wrote about weights in the latter part of the 4th century, and DIODORUS a little later. That this work by EPIPHANIUS was thus by no means indispensable among the Greeks may account largely for the present state of the Greek text. It seems to have been neglected because not recognized as of special value. But when translated into Syriac the work filled a larger need and found for itself a much more secure place. As late as 1272 EPIPHANIUS is frequently quoted by BARHEBRAEUS in his *Awṣar 'Râzê* or scholia on the Sacred Scriptures. The Syriac version of Weights and measures was so highly treasured that an extract from it is even found in the Karkaphensian (1) Massorah manuscript " belonging to Mar SEVERIUS, archbishop of Syria and the Lebanon.

I am not competent to discuss the value of Mr. DEAN's work from the philological side, nor is *Isis* the place for such a discussion, but the work has apparently been done with loving care. G. S.

Richard Hakluyt.—*The original writings & correspondence of the Two Richard Hakluyts.* Edited with an introduction and notes by E. G. R. TAYLOR. (2 vols., XIV+XIV+516 pp., with 10 illustrations and maps). London, The Hakluyt Society, 1935.

The writings and documents printed in these two volumes give us a detailed picture of the activities of sixteenth-century England's leading propagandists for colonial expansion. There is little here that is actually new to historians, for these materials were used by Professor G. B. PARKS in his *Richard Hakluyt and the English Voyages* (1928), a work to which Professor TAYLOR makes ample acknowledgement of her indebtedness. But Miss TAYLOR has now collected and made readily accessible to scholars what hitherto was buried, for the most part, in rare books and public archives. From the pages of these volumes one may gain a more intimate knowledge of the manifold interests and connections of the great Elizabethan promoters of geographical knowledge and maritime enterprise, and can thus appraise more adequately their influence upon the events of their times.

Miss TAYLOR'S intimate acquaintance with the intricacies of geographical study and exploration in the sixteenth century has enabled her to supply many illuminating notes to these documents, which greatly enhance our understanding of the relationship of the HAKLUYTS to other influential actors in the drama of Elizabethan history. Moreover, her

(1) For the Karkaphensian tradition see for instance, WILLIAM WRIGHT'S Short history of Syriac literature (London 1894, 20).

introduction of some 66 pages is not only a running commentary upon the writings she reprints, but serves also to provide most useful short biographies of the two cousins, emphasizing their varied activities in furthering overseas exploration and colonization. Whether one's interest in the work and influence of the two RICHARD HAKLUYTS is primarily historical, literary, or scientific, the material here assembled will prove indispensable to his study. The historian of science, in particular, will find in these volumes abundant illustrations of the way in which the most noted sixteenth-century students of the science of geography in England organized and exploited their knowledge for the purpose of futhering important practical ends.

Stanford University. FRANCIS R. JOHNSON.

Mersenne, M.— *Correspondance du P. Marin Mersenne*, religieux Minime, publiée par MME PAUL TANNERY, éditée et annotée par CORNELIS DE WAARD, avec la collaboration de RENÉ PINTARD. Tome II, 1628-1630; XVI + 708 pp., ill.; Paris, BEAUCHESNE, 1937, 120 frs.

Depuis que le tome I de la *Correspondance du P. Marin Mersenne* a vu le jour (*Isis*, 20, 467-470), il est permis de se demander s'il n'y a pas quelque impertinence à rendre compte des volumes suivants de cette publication essentielle et parfaite. Celle-ci, en effet, s'est imposée aux historiens et aux érudits avec une telle nécessité, que seul le plaisir de dire à MME TANNERY, à M. DE WAARD et à leur collaborateur Mr. PINTARD, la reconnaissance et l'admiration que nous leur vouons, nous incite à encourir le risque de paraître ridicule en venant célébrer encore les mérites et l'importance de leur œuvre.

M. GINO LORIA a eu infiniment raison de dire qu'aucune collection de lettres ne donne une idée aussi exacte et complète de la science à l'époque de MERSENNE : il y a trois cents ans, on savait tout, on pouvait s'intéresser à tout; bien des mesures sont faites pour la première fois, et une détermination même approximative constituait déjà une grande découverte; la foi que l'on avait alors dans la simplicité des lois naturelles permettait de tirer un énoncé précis d'une mesure presque grossière.

Le présent volume nous apporte une centaine de lettres, couvrant la période 1628-1630 et commentées avec une stupéfiante érudition; il s'en faut qu'il y soit toujours question de science; ces lettres, outre celles de MERSENNE lui-même — qui fut, avec une étonnante liberté d'esprit l' "entremetteur de tous les honnestes gens", selon l'expression de CONSTANTIN HUYGENS —, émanent notamment de PEIRESC, GASSEND, BEECKMAN (dont le *Journal*, encore inédit hélas ! est très largement utilisé et fournit en particulier des lumières nouvelles sur l'auteur du *Discours de la Méthode*), DESCARTES, KEPLER et VAN HELMONT. Certes, ces lettres

ne sont pas toutes inédites, mais il n'est pas exagéré de dire que les notes et commentaires si précieux qui les accompagnent vont jusqu'à renouveler souvent le sens et la portée de celles qui avaient été déjà publiées. Certains commentaires — la série de ceux par exemple qui commencent au milieu de la p. 55 — constituent en fait de véritables histoires résumées, ou mieux, les résumés d'histoires qui n'ont pas été écrites encore, et nous devons à ce sujet déplorer l'absence d'une table analytique des matières, défaut qui découragera peut-être bien des lecteurs pressés pour qui tous ces trésors risquent de demeurer perdus; une telle table s'imposerait, croyons-nous, dans les volumes ultérieurs.

Les lettres de VAN HELMONT nous ont particulièrement intéressé (et, disons-le en passant, elles nous font attendre avec une impatience singulière le tome III, dont le début comportera un grand nombre d'épîtres du savant brabançon). C'est que, entre autres choses, ces lettres illustrent à merveille, en effet, la thèse suggérée dans notre analyse du tome I, et selon laquelle il n'y a pas de solution de continuité entre la pensée du primitif et celle du savant d'une époque relativement rapprochée (1). Ce serait un jeu aisé, pensons-nous, de substituer aux primitifs des profonds ouvrages de M. LUCIEN LÉVY-BRUHL, un CARDAN (voir son autobiographie si curieuse) ou un VAN HELMONT (voir ce tome II de la *Correspondance du P. Marin Mersenne*, pp. 497 et 498 sq.; cf. aussi p. 520).

A propos de DESCARTES, notons les précisions suivantes : M. DE WAARD confirme, en ce qui concerne la lettre de DESCARTES (édit. A.-T., I, 18 sq.) qu'il s'agit bien, comme le pensait PAUL TANNERY, de la première lettre que DESCARTES ait écrite de Hollande à MERSENNE; deux lettres de DESCARTES de date incertaine et données dans A.-T. (IV, 684 sq. et 694 sq.) comme étant adressées à BOSWELL, sont considérées ici, en partie tout au moins, comme ayant MERSENNE pour destinataire; enfin, le destinataire de la lettre de DESCARTES du 3 juin 1630 (A.-T., I, 151 sq., "27 mai 1630?") est identifié sans hésitation avec MERSENNE.

Deux appendices, relatifs aux lois du choc des corps et à la pression de l'air, sont basés sur le *Journal* de BEECKMAN, dont l'importance est soulignée une fois de plus; ils constituent indirectement d'originales contributions à l'étude de la pensée cartésienne : on constatera que les règles célèbres de DESCARTES sur le choc des corps figurent dès 1618 dans le *Journal* de BEECKMAN, sous une forme beaucoup plus exacte que celle

(1) Nous nous permettons de renvoyer le lecteur que ce sujet intéresse aux importantes conclusions de la conférence faite en juillet 1936, devant le Comité belge d'histoire des sciences, par M. GEORGES SMETS, ancien recteur de l'Université libre de Bruxelles, directeur de l'Institut de sociologie Solvay. (*Archeion*, vol. XIX, 1937, n° 1, pp. 56-66).

sous laquelle le philosophe français devait les publier en 1644 (cf. pp. 632 sq.); on verra aussi que BEECKMAN considéra très tôt la pression de l'air comme se propageant également dans toutes les directions, ce que DESCARTES ne semble pas avoir admis: ajoutons à ces priorités de BEECKMAN celle d'avoir donné correctement (cf. pp. 122 sq. et 319 sq.) la loi de la chute des graves, à propos de laquelle DESCARTES s'était trompé. Un troisième appendice, relatif à l'arc-en-ciel, est constitué par un passage (1628?) d'un manuscrit de MERSENNE : un quatrième appendice enfin étudie la réfraction chez CORNIER et chez DESCARTES.

Les variantes des textes sont très soigneusement indiquées, mais nous devons à la vérité de reconnaître que le nombre d'omissions et d'erreurs que comporte l'index onomastique nous a surpris.

Comme le tome I, ce volume est dédié à la mémoire de PAUL TANNERY.

JEAN PELSENEER.

William Stukeley. — *Memoirs of Sir* ISAAC NEWTON'S *life*, 1752. Edited by A. HASTINGS WHITE, consulting librarian to the Royal Society. XVII + 86 pp., ill.; London, TAYLOR and FRANCIS, 1936; 5 s. net.

WILLIAM STUKELEY (1687-1765), médecin, théologien et archéologue, F.R.S. (20 mars 1717/8), était le compatriote de NEWTON et entretint des relations d'amitié avec celui-ci à la fin de la vie du savant. Des notes rassemblées par STUKELEY avaient fait partie de la Portsmouth Collection avant la dispersion de celle-ci en juillet 1936 (1) et avaient été consultées notamment par BREWSTER et MORE. Mais le document dont nous devons la publication à M. A. HASTINGS WHITE, était entièrement inédit jusqu'à ce jour; en possession d'un descendant de STUKELEY et mis en vente en 1931, il se trouve à présent à la Royal Society; c'est une deuxième rédaction, plus complète et mieux ordonnée, encore qu'en fin de compte mal composée, qui nous est en réalité donnée.

STUKELEY raconte d'abord comment il s'y prit - à partir de 1726 - dans sa chasse aux renseignements, et ce n'est pas la partie la moins intéressante de son Mémoire, qui date de 1752. Citons ici l'éditeur : "Considered merely as a literary effort, this essay possesses but little merit. STUKELEY was no master of style, or of nervous English. But as a contemporary contribution to Newtonian biography it is both interesting and valuable. Though neither mathematician nor experimental scientist, STUKELEY was a scholar, and the Essay shows us the contemporary scholar's profound admiration of NEWTON. He fully shared the NEWTON worship of the

(1) cf. *Catalogue of the Newton papers sold by order of the Viscount Lymington*, SOTHEBY & Co; 1 vol., London, 1936; p. 60.

time; his admiration, awe and reverence knew no bounds. STUKELEY was not critical-minded, nor was he technically competent; but others, who were, justified him " (p. XIII).

Certes, les contributions originales qu'il apporte à la biographie de NEWTON ne sont pas très nombreuses, sauf en ce qui concerne la jeunesse et la période des débuts. Mais à défaut d'autobiographie ou de journal, un document tel que celui-ci apparaît singulièrement précieux. Il contient deux révélations véritablement sensationnelles : d'une part, la relation d'une conversation avec NEWTON (pp. 19-20) permet de faire entrer définitivement dans l'histoire l'anecdote fameuse de la pomme (1); d'autre part, HALLEY aurait laissé tout un matériel de notes biographiques concernant l'auteur des *Principia* (p. 52).

L'ouvrage est bien imprimé, mais il faut déplorer l'absence d'un index.

J. PELSENEER.

John Garret Winter (Ed.).—*Papyri in the University of Michigan Collection.* Miscellaneous Papyri. XVIII and 390 p., 7 Plates, 3 Figures in the text, (University of Michigan Studies, Humanistic Series, Vol. XL = Michigan Papyri, Vol. III). Ann Arbor, University of Michigan Press, 1936 ($ 5.00).

According to the editor's preface, the papyri presented in this volume, consisting in the main of earlier purchases, were prepared for publication by a group of eight scholars working at the University of Michigan, three of them being students in the papyrological seminary, the rest members of the faculty.

The texts deal with a great variety of subjects : there are 8 biblical, 4 classical, 5 mathematical, and 4 astrological fragments, moreover 2 horoscopes, 3 magical charms, 2 " Libelli of the Decian Persecution," 14 official documents (such as a list of officers, a request for appointment of a guardian, birth certificates, etc.), 3 petitions, 6 documents concerning taxation (census declarations and declarations of property), 18 contracts, an agricultural account, and 21 private letters. An investigation by ERNST HONIGMANN, on " *Die Anaphorai der alten Astrologen* " written in German ; and extensive indexes (15 in number !) conclude the splendid volume.

In this short review, only those fragments treating of mathematical and astrological questions can be considered (P. Mich. Nos. 143-156)

In the first of the mathematical fragments (No. 143, 3rd century), we find the first ten definitions from EUCLID's *Elements*, Book I, apparently

(1) Voir notre article sur « La pomme de Newton », dans *Ciel et Terre*, LIII[e] ann., juin 1937.

a lesson written from memory by a young student of mathematics. Nos. 144-147 (2nd to 4th century) contain algebraic and arithmetical problems, as well as some very elaborate tables of fractions in which, according to the Egyptian and Greek usage, a multiple of a fraction having 1 as numerator (" unit fraction ") is again expressed as the sum of such unit fractions, as for instance

$$\frac{1}{23} = \frac{1}{23}; \quad \frac{2}{23} = \frac{1}{12} + \frac{1}{276}; \quad \frac{3}{23} = \frac{1}{10} + \frac{1}{46} + \frac{1}{115}; \text{ etc.}$$

No. 148 is probably a fragment of an astrological treatise composed in the 1st century which gave a series of predictions based on the conjunctions of the moon with the planets occurring on the different days of the month or of the lunation.

While the texts hitherto mentioned do not contribute anything of particular importance to our historical knowledge, the long 2nd century astrological treatise, No. 149 (first published by FRANK E. ROBBINS in *Class. Phil.*, XXII, 1927, 1-45) consisting of 18 pieces of varying size and irregular shape, is certainly of great interest in more than one respect. It sets forth, in its first part, a planetary μελοθεσία which consists of the ascription of successive sections of the human figure, ἀνδριάς, from the head down to the feet, to the planets in the order " Sun, Moon, Saturn, Jupiter, Mercury, Mars, Venus." The extent of each section is determined by the number of minutes of degrees in one-third of the radius of the epicycles of each planet. The same principle is used for determining the extent of the seven ὅρια (*termini* or *fines*), the sequence of their lords being the same as above. The system of *termini* here in use is essentially different from all others heretofore known. Ordinarily, each sign of the zodiac is subdivided into five or seven *termini* of different extent (the number of degrees attributed to each of them, and the sequence of their lords varying in different astrological systems, cf. BOUCHÉ-LECLERCQ, *L'astrologie grecque*, Paris, 1899, pp. 206-15). According to the theory of our anonymous author, however, the *termini* refer, not to single signs, but to parts of the 4 quadrants, each of them being divided into two unequal parts of 48 and 42 degrees respectively, of which the former are called ἐμπρόσθια, the latter ὀπίσθια. Another bipartition of the quadrants yields eight sections alternately called κραταιαὶ μοῖραι and δαιμονιώδεις, as is shown by the following figure, which I am able to reproduce owing to the editor's kind permission.

The " *planetary melothesy* " as well as the theory of *termini* here in use are unique in Greek astrological literature.

The table of the ἀναφοραί (oblique ascensions) of the zodiacal signs

in the 7 astrological climates (see p. 103) again is arranged in an entirely unusual way. It gave rise to HONIGMANN's profound analysis of the question printed as an appendix to this volume (pp. 301-21), in which the learned author arrives at highly interesting conclusions.

The remaining four texts (Nos. 150-153, 2nd to 5th century) are

again of lesser importance, the two first consisting of fragmentary tables (No. 150 designated, without obvious reason, as " astrological ", No. 151 as " astronomical "), the others of brief dated horoscopes, of which the last bears witness of its author's unfamiliarity with the art of computing.

The critical apparatus is excellent in every respect, and the same is true as to the translations. One single criticism, however, may be allowed : the Greek term *ἐπαγομένη* (*ἡμέρα*) should not be rendered by the English " intercalary day " (p. 121), but rather by an expression like " epagomenal day " ; the five epagomenal days form part of the ordinary Egyptian year, and only the sixth epagomenal day inserted every four years (in the Egyptian calendar ordered by the decree of Canopus, as well as in that of the Late Time) has a right to be called intercalary (*ἐμβόλιμος*).

Harvard University. WILLY HARTNER.

Daniel V. Thompson.—*The materials of medieval painting.* 239 p. ALLEN and UNWIN, London 1936 (7s 6d).

Professor THOMPSON has written an extremely interesting and valuable book on a subject very rarely dealt with—the materials used by medieval painters, or as he calls it " the cookery of art." The author is already well known for his editions and translations of quite a number of medieval treatises on the technical aspects of art, for instance the *Il libro dell'arte di Cennio d'Andrea Cennini* (1933), *De arte illuminandi*, an anonymous 14th century work edited and translated in collaboration with G. H. HAMILTON (1933), the *De clarea of the Anonymous Bernensis* (1932), and others. These treatises as well as many unpublished ones, most of them written in France, England, or Spain, between the eleventh and fifteenth centuries, have been used for this present synthesis.

In the first chapter the author discusses the various types of surfaces employed by the medieval painters, such as parchment, vellum, wood, walls, and canvas. He tells us how each surface had to be prepared and all the difficulties which were encountered in each case. His discussion of parchment making is particularly valuable not only for an understanding of medieval painting but also for medieval book making in general. In chapter two he deals with the different binding media that had to be used to bind the pigments to the different types of surfaces. The sources and natures of these media, such as the glair and gums used principally for books, egg yolk in painting on panels, lime on walls, and size and oil on woodwork, are treated in detail, and the advantages and disadvantages of each one are fully explained. In some cases the modern ways of employing these same media are compared and contrasted with the medieval methods. The third and longest chapter deals with the pigments themselves. Following the usual medieval custom, the author divides these pigments into two classifications ; natural, for instance, the natural deposits of metallic salts, crushed stones, vegetable salts, etc., and artificial, those made from manufactured salts. The sources, methods of preparation and the manner of employment of each pigment by the painters, are discussed at some length. In the Middle Ages metals were used extensively in painting, especially in illuminated manuscripts. Of course gold was the favorite one because of its richness and its general significance, and its permanence. The methods of preparing gold and the different ways is which it was used are carefully explained in the fourth and last chapter.

This book, written in a very pleasing style, will appeal not only to those interested in medieval painting itself, but to any one who wishes

further knowledge on various medieval plants, and on certain chemical problems of the Middle Ages.

Cambridge, Massachusetts MARY CATHERINE WELBORN.

K. Chimin Wong and **Wu Lien-teh.**—*History of Chinese medicine.* Being a chronicle of medical happenings in China from ancient times to the present period. Second Edition, XXVIII + 906 p., frontispiece, 53 half-tone plates, 14 text figures. Shanghai, National Quarantine Service, 1936. (Price : in China, C. S. $ 24.00; abroad, U. S. $ 9.00)

The first edition of this voluminous work (published in 1932 by The Tientsin Press, Ltd.) was reviewed by Dr. GEORGE SARTON in *Isis*, 20, 480-2. Though it is not customary to analyze every new edition of a work once reviewed in this periodical, an exception from the rule seems justified in the present case. It will be sufficient to quote a passage from the preface :

" Every effort has been made to rectify defects discovered in the first edition. The whole work has been brought up to date ; many new facts have been added and unimportant details either deleted or relegated to the appendices. Several chapters have been entirely re-written, while new ones have been added. For instance, *Book One* which deals with the evolution and development of the indigenous art now contains twenty-six chapters instead of twenty-one. The chapters on Ancient Drugs, Cultural Aspects of the Mediaeval Period, Decline of the Native Practice, Prominent Practitioners of the Ch'ing Dynasty (not " Ching," as spelled in many places in the present work !), and Struggle between the New and the Old Forces are entirely new, while much additional matter has been incorporated in the text and the appendices. In the case of *Book Two* which treats of the introduction and progress of modern medicine, a thorough revision has been effected in the existing chapters, whilst the epochal events of the past eight years are described in a separate chapter dealing with the consolidation of medical work under government auspices.

In spite of drastic efforts to eliminate tedious details and matter of purely topical interest, the additions made necessary by the relentless march of progress have more than counterbalanced the saving in bulk that would otherwise have been effected. The net result is an increase of two hundred pages."

Revising and partly re-writing a book which comprises more than 700 pages and pretty nearly 1400 footnotes and cross references, a few years after its first appearance, must be called a heavy task. But the splendid result undoubtedly repays the trouble which the authors have taken in order to make the work as perfect as possible. The account of the

introduction and the development of modern Western medicine in China, given on nearly 600 pages in Book II, exhausts every detail worth knowing, from the time of the first sporadic contacts of China with Western medicine, before and under the Mongol conquerors, to the year 1936 A. D. To the historian of indigenous Chinese healing-art, the increase of Book I which now is about double as bulky as in the original edition, will be particularly welcome. This part is in its present form far more satisfactory than it was at its first appearance. To quote one example, the expanded chapter on the Philosophy of Disease now gives an excellent account of the doctrines of *Yin-Yang*, of the *Pa-Kua*, and of the *Five Elements* and their application to the organs of the human body and their diseases. The most valuable addition is perhaps the new chapter " Notes on Some Famous Ancient Drugs," where we read about the remarkable and miraculous *Ginseng* root (*Jen-shen*, 5624, 9824 [11548]) whose story is strikingly similar to that of the Mediaeval European *mandrake root*; moreover about the *Chaulmoogra oil* which, in China, appears to have been used as a remedy against leprosy as early as the 14th century (*Ta Fêng Tzu*; the Chinese characters : 10470, 3555, 12317, are by a mistake omitted in the text), and *Ma Huang* (7591, 5124), *Ephedra vulgaris*, mentioned already in the *Pen-Ts'ao Kang-Mu* (finished. 1578 A. D.) from which the famous preparation *Ephedrine* is derived.

The account given of *moxibustion* still falls a little short, as compared with its immense importance in vernacular Chinese medicine. It would also have been worth while to allude to the use of this somewhat dubious remedy outside China : as is well known, the Northern Eurasiatic nomade tribes applied *moxa* against all kinds of illness, and the therapy even penetrated as far as Northern Norway, where the Lapps to this day make extensive use of it (1). This is certainly a fact from which valuable conclusions as to the transmission of rudimentary scientific methods and ideas can be drawn.

Harvard University WILLY HARTNER.

Emile Picard.—*Discours et notices.* viii + 363 p. Paris, GAUTHIER-VILLARS, 1936 (50 francs).

M. PICARD continue dans le meilleur style — n'est-il point aussi de l'Académie française?—une des plus belles traditions de l'Académie

(1) Cf. J. QUIGSTAD, *Lappische Heilkunde* (Instituttet for sammenlignende Kulturforsknin. Serie B, Vol. XX, Oslo, 1932), pp. 128-133, and I. MANNINEN, *Niin sanotun moksain käytöstä kansanomaisessa parannustaidossa* (" On the Use of the so-called Moxa in Vernacular Medicine "), in the Finnish periodical *Valvoja*, 1921, pp. 258-265.

des sciences. Un des devoirs des secrétaires perpétuels consiste à préparer des biographies et d'autres travaux historiques. Grâce à cette sage disposition, les historiens des sciences ont déjà toute une série d'ouvrages contenant des matériaux de tout premier choix pour l'étude de la pensée moderne. Il suffit de rappeler les noms de quelques auteurs : JOSEPH DELAMBRE, FRANÇOIS ARAGO, JOSEPH BERTRAND qui furent parmi les prédécesseurs de M. PICARD, d'autre part GEORGES CUVIER, MARCELIN BERTHELOT qui furent secrétaires pour les sciences physiques, et leur successeur actuel, M. ALFRED LACROIX. A M. PICARD, qui succéda à GASTON DARBOUX en 1917, nous devons déjà une série impressionante d'ouvrages historiques, entre autres les *Discours et mélanges* (1922; *Isis* 5, 519), les *Mélanges de mathématiques et de physique* (1924 ; *Isis* 8, 562), les *Eloges et discours académiques* (1931 ; *Isis* 17, 443) ; à côté desquels s'aligne en quatrième place le présent volume. Tous ces ouvrages sont publiés par le même éditeur, GAUTHIER-VILLARS, et leurs titres tant soit peu différents ne sont introduits que pour la commodité. Ils auraient pu être appelés tout aussi bien *Discours et mélanges*, vol. I, II, III et IV.

Le dernier volume contient ce qui suit :

" Introduction; La vie et l'œuvre de GABRIEL LIPPMANN; La vie et l'œuvre de JOSEPH BOUSSINESQ; L'évolution des idées sur la lumière et l'œuvre d'ALBERT MICHELSON; L'évolution de l'idée de fonction pendant le XIX^e^ siècle; Introduction au volume : SADI CARNOT, Biographie et manuscrit; Inauguration de la maison des élèves de l'École centrale; La propriété scientifique; Le centenaire de l'École centrale; La culture générale du jeune français; Le cinquantenaire de l'École normale de Sèvres; Discours prononcés aux deux dernières assemblées générales du Conseil international de recherches à Bruxelles; Le centenaire du physicien NICOLAS SADI CARNOT; Inauguration du monument élevé à la mémoire du général FERRIÉ; Une édition nouvelle du discours de la méthode de DESCARTES; Quelques savants à l'Académie française; Jubilé scientifique d'EDOUARDGOURSAT; Jubilé scientifique de MARCEL BRILLOUIN."

Il est assez remarquable que les trois premiers articles qui remplissent plus de la moitié de l'ouvrage soient des biographies non pas de mathématiciens, mais de physiciens. Il est regrettable qu'il n'y ait pas d'index, car d'excellents morceaux sont cachés dans des endroits inattendus. Par exemple on ne s'attendrait pas à trouver une discussion de la mécanique d'ARISTOTE dans la vie de BOUSSINESQ (p. 97), ou de la théorie des couleurs de NEWTON dans celle de MICHELSON (p. 135). Certains articles sont déjà anciens, tel celui sur l'extension de l'idée de fonction pendant le dix-neuvième siècle qui remonte à 1899 (conférence faite à Clark University); mais on est fort heureux de les retrouver.

Pour donner une idée de la manière de l'auteur, qu'on me permette

de citer quelques réflexions sur le caractère de JOSEPH BOUSSINESQ (1842-1929) :

" Depuis quelques années, notre confrère vivait très retiré dans un petit pavillon situé au fond d'une cour. Les commencements de sa carrière avaient été difficiles, et il en avait conservé un fond de tristesse qu'accrût encore peu à peu son état maladif. Il avait toujours eu horreur du monde, jugeant sévèrement les propos qu'on y entend souvent, se montrant d'ailleurs très réservé dans les jugements sur les personnes et plutôt disposé à la bienveillance. Sa conversation prenait facilement un tour religieux, et même, dans un épilogue de son Cours, on peut lire deux longues notes sur les analogies platoniciennes et chrétiennes, ainsi que sur une théorie théologique du bonheur, attribuant les meilleures places dans le Banquet de la vie, même dans l'existence d'ici-bas, à l'étude désintéressée et humble de la vérité.

Étude désintéressée et humble de la vérité : ces mots résument bien la vie de BOUSSINESQ, qui fut toujours peu soucieux des honneurs. Il terminait ses *Leçons de physique mathématique* par des remarques sur l'immensité de notre ignorance. Insistant sur le caractère forcément hypothétique de certains principes de la science, il remarquait que ' le savant a tout lieu d'être modeste, humble même, dans son triomphe si péniblement obtenu.' Ce sentiment, il le trouvait traduit de la manière la plus heureuse dans la fresque de PUVIS DE CHAVANNES du grand amphithéâtre de la Sorbonne, où sont rassemblés dans une clairière des représentants des études littéraires, scientifiques et artistiques, clairière où règne une lumière sereine, mais environnée de toute part par une épaisse forêt inaccessible. ' De même, écrit BOUSSINESQ, l'ensemble de nos connaissances claires se trouve comme perdu au milieu d'un océan de ténèbres '."

Le style de M. PICARD est simple, honnête, austère ; on voit qu'il se défie des amplifications auxquelles la langue française ne se prête que trop aisément. Les historiens de la science lui doivent beaucoup de reconnaissance pour sa défense de leurs chères études (voir p. 264) et pour tous ses écrits historiques, dont les parties les plus précieuses sont celles où il évoque ses propres souvenirs. GEORGE SARTON.

Wilhelm Gundel.—*Dekane und Dekansternbilder.* Ein Beitrag zur Geschichte der Sternbilder der Kulturvölker. Mit einer Untersuchung über die ägyptischen Sternbilder und Gottheiten der Dekane von S. SCHOTT. (*Studien der Bibliothek Warburg*, herausgegeben von FRITZ SAXL, Band XIX. Glückstadt und Hamburg, J. J. AUGUSTIN, 1936). X+452 Seiten; 33 Tafeln.

Es ist ausserordentlich zu begrüssen, dass der bekannte Giessener Gelehrte WILHELM GUNDEL sich der schwierigen Aufgabe unterzogen hat, eine geschlossene Darstellung der kulturgeschichtlich höchst interessanten und aufschlussreichen Frage der Dekane und Dekansternbilder zu geben, die in der hellenistischen und mittelalterlichen Astrologie eine ausgezeichenete Rolle spielten. Über die Beweggründe zur Abfassung des Werkes sagt der Verfasser im Vorwort :

"Die Abhandlungen über mehrere antike Tierkreisbilder, die ich für die *Realenzyklopädie der klassischen Altertumswissenschaft*, herausgegeben von PAULY-WISSOWA-KROLL, geschrieben habe, zwangen mich dazu, mich immer wieder mit den interessanten Teilgebilden derselben, den Dekanen, zu befassen, ihre Gestalten und ihre Wirkung auf Erden-, Völker- und Menschenschicksal aus den antiken Nachrichten zusammenzustellen. A. WARBURG, der sich speziell mit den mittelalterlichen Darstellungen der Dekane befasst hatte, regte mich vor nahezu zehn Jahren dazu an, eine Synopse aller auffindbaren Namen und Bilder zu machen. Das führte von selbst dazu, einmal nach der Herkunft dieser Sterngötter zu fragen und dann ihren Schicksalen nachzugehen, die sie auf ihren über Jahrtausende sich erstreckenden Wanderungen im Osten und im Westen erlitten haben. Das Problem stellte Aufgaben von grösster Schwierigkeit und führte zu Quellenstudien auf den verschiedensten Gebieten, denen ich allein nicht gewachsen war. So musste ich mich nach verschiedenen Seiten um Hilfe umsehen. Vor allem galt es einen Bearbeiter des ägyptischen Materials zu finden. Durch Frau KLEBS gelang es mir, Herrn S. SCHOTT für diese umfangreiche und zeitraubende Aufgabe zu gewinnen, er hat die erwünschte Unterlage im ersten Teil der vorliegenden Untersuchung geschaffen. Ausserdem durfte ich Herrn A. POGO für die Erklärung des Tübinger Sarkophages und Herrn ZYHLARZ für die Deutung des runden Tierkreises in Athen zu Rate ziehen."

Das zur Besprechung vorliegende Werk ist trotz manchen Mängeln ohne Zweifel der wichtigste Beitrag zur Geschichte der Astrothesie seit der im Jahre 1903 erschienenen *Sphaera* FRANZ BOLLS, zu dessen wissenschaftlichem Werk der Verfasser lange in enger Beziehung stand (es genügt, in diesem Zusammenhang auf die von GUNDEL besorgte wesentlich erweiterte 3. und 4. Auflage von BOLL-BEZOLDS "*Sternglaube und Sterndeutung*" zu verweisen). Viele der von BOLL angeschnittenen Fragen finden bei GUNDEL ihre Lösung, manche Irrtümer ihre Berichtigung.

Der erste Teil enhält den Beitrag S. SCHOTTS über die altägyptischen Dekane (S. 1 — 21) und A. POGOS Analyse des Kalenders auf dem Sargdeckel des IDY in Tübingen (S. 22-26), eine äusserst interessante Ergänzung von POGOS im Jahre 1932 veröffentlichten Untersuchungen über "*Calendars on Coffin lids from Asyut*" und "*The astronomical inscriptions on the coffins of Ḥeny* (*Isis* XVII, XVIII), in der insbesondere auch auf den möglichen Zusammenhang der diagonalen Kalender mit den Skalen der Auslaufuhren Bezug genommen wird; wie der Verfasser am Ende seines Beitrags betont, lässt es sich jedoch vorläufig noch nicht entscheiden, ob dieser Zusammenhang tatsächlich bestanden hat und ob die Auslaufuhren älter als die diagonalen Kalender sind. Betreffs der Frage der Datierung der Kalender auf Grund der Spaltenüberschriften ist POGOS Feststellung wichtig, dass zuverlässige Anhaltspunkte nicht gewonnen werden können, da die Überschriften gegen Ende des 3. Jahrtausends bereits "hoffnungslos erstarrt" waren und keine Rücksicht auf die in den einzehlen Spalten angefürten Aufgänge der Dekane von Sonnenuntergang bis Sonnenaufgang nehmen. ZINNERS Errechnung des Alters der

Dekanliste vom Grabe des MSAHITI aus der Lage des Trennungsbandes zu den Monaten des beweglichen Jahres (2047 v. Chr) (1) erweist sich somit als hinfällig.

Dem Beitrag SCHOTTS, der sich u. a. mit den Namen der Dekane, der Dekanteilung, der Dekanfeldverschiebung, den Dekanen als Zeitsternbildern (vgl. POGOS genannte Arbeiten), und den Dekan- und Dekadengöttern der Spätzeit beschäftigt, ist am Ende (S. 18 — 21) eine ausführliche Tabelle der den Dekanen in römischer Zeit zugeordneten Gottheiten angefügt, gemäss den Darstellungen von Dendera und Esne. SCHOTTS Beitrag ist leider wenig übersichtlich gegliedert und lässt viele wichtige Einzelheiten unberührt. Es ist sehr zu hoffen, dass die auf S. 2 (Fussnote 6) in Aussicht gestellte besondere Arbeit das Fehlende nachtragen wird.

Im zweiten Teil (S. 27 —324) hat GUNDEL die Ergebnisse seiner eigenen umfangreichen Studien über "*Die Dekane im Altertum, Mittelalter und in der Neuzeit*" niedergelegt :

1. Kapitel : Die Bezeichnungen der Gesamtheit der Dekane,
2. Kapitel : Die Geschichte der einzelnen Dekannamen,
3. Kapitel : Die Bilder der Dekane in der abendländischen und orientalischen Literatur,
4. Kapitel : Die bildliche Darstellung der Dekangötter und ihre Umgestaltungen in Altertum, Mittelalter und Neuzeit,
5. Kapitel : Das Wesen, die Wirkungssphären und die Wirkungsart der Dekane,
6. Kapitel : Die Bedeutung und die Wirkung der Dekane in den verschiedenen okkulten Lehren.

Es ist selbstverständlich völlig ausgeschlossen, im Rahmen einer kurzen Besprechung auch nur einen oberflächlichen Einblick in die Fülle des verarbeiteten Materials und der gewonnenen Ergebnisse zu vermitteln.

Von grösstem Wert sind die dem Text beigegebenen zahlreichen Tabellen (wie etwa die Namen der Dekane, S. 77-81, die Dekane nach den literarischen Darstellungen (Bilder und Attribute), S. 160-174, die mit den Dekanen in Verbindung stehenden Tiere, S. 223-225, die Wirkungen der Dekane auf den Menschenkörper (Dekanmelothesie), S. 286-87, u.a.m.) Es ist besonders zu begrüssen, dass der Verfasser durch das Entgegenkommen der Bibliothek Warburg auch die im Manuskript vorliegende deutsche Übersetzung des arabischen "*Picatrix*„ von MARTIN PLESSNER mitheranziehen konnte. Der arabische Text dieses kulturhistorisch so wichtigen Dokuments, dessen Wiederentdeckung wir A.

(1) *Geschichte der Sternkunde*, Berlin, 1931, S. 19.

WARBURG verdanken, erschien 1933 als XII. Band der *Studien der Bibliothek Warburg*, herausgegeben von HELLMUT RITTER unter der Mitarbeit PLESSNERS. Das arabische Original bietet jedoch auch für den Arabisten vom Fach inhaltlich grösste Schwierigkeiten, und wir sehen daher der Veröffentlichung der Übersetzung und Interpretation M. PLESSNERS, eines so ausgezeichneten Kenners der Materie, mit Ungeduld entgegen. Trotz den widrigen Zeitumständen ist das Erscheinen derselben erfreulicherweise für die nahe Zukunft in Aussicht gestellt.

Die innere Verwandschaft und Abhängigkeit der Quellen ist eingehend erörtert und die Ergebnisse finden sich in instruktiven Übersichten zusammengefasst (Schemata S. 45 und 92/93).

Ein Anhang (S. 325-425) umfasst einerseits eine Untersuchung über die Geschichte der Tierkreisbilder ("*Tierkreisbilder und Dekane, Ein Beitrag zur Geschichte der Tierkreisbilder*„), andrerseits ein "Textbuch„ der Dekanliteratur, in dem zahlreiche sonst schwer zugängliche Textstellen in deutscher Übersetzung wiedergegeben sind, u.a. auch ein Fragment aus den leider verlorenen *Salmeschoiniaka*. Ein umfangreiches Personen- und Sachverzeichnis, (S. 426-51) zusammengestellt von H. GUNDEL), sowie 33 Tafeln beschliessen das Werk.

Im Anschluss an die Ausführungen auf S. 124 über die beiden ersten Dekane der Zwillinge, bei denen von dem mit der Göttin des 1. Dekans gleichzeitig aufgehenden "*Spiegel* der Spiegelpolierer„ die Rede ist (APOMASAR), andrerseits von dem Mann mit der Rute in der Hand und (beim 2. Dekan) vom *Apfel*dieb (HERMANN DALMATA), möchte ich auf den möglicherweise bestehenden Zusammenhang mit mittelalterlichen islamischen Darstellungen der Zwillinge hinweisen : In diesen Darstellungen sind häufig die Tierkreisbilder kombiniert mit ihren Herrschern wiedergegeben; dabei erscheint regelmässig Merkur als Nachtherrscher der Zwillinge durch einen von den beiden Zwillingen in ihrer Mitte gehaltenen Stab repräsentiert, der am oberen oder an beiden Enden einen *Spiegel* (oder eine Maske) trägt. Ferner dürfte hierauf auch ein Passus aus dem "*Buch Physiologica über die Talismane*„ Bezug nehmen (vgl. J. Ruska, Griechische Planetendarstellungen in arabischen Steinbüchern, *Sitz.- ber. der Heidelberger Ak. d. Wiss., Philos.- hist. Kl.*, 1919, 3. Abhandlung, S. 46 und 48) : "Merkur... ein junger bartloser Mann, in seiner Rechten ein Stab, und auf der Spitze des Stabes ein *Apfel*.„

In dem "*Beitrag zur Geschichte der Tierkreisbilder*„ des Anhangs führt GUNDEL zahlreiche Argumente dafür an, dass der Tierkreis in Wahrheit ägyptischen, nicht babylonischen Ursprungs ist; seine Beweisführung ist interessant und anregend, jedoch nicht durchaus überzeugend und unanfechtbar. In einer demnächst erscheinenden Untersuchung weise ich auf den Umstand hin, dass sehr gewichtige Gründe für die Annahme

bestehen, dass zum mindesten vier Hauptsternbilder des Tierkreises (Stier, Löwe, Skorpion und Steinbock), die durch ihren heliakischen Aufgang die Anfänge der Jahreszeiten bezeichneten, bereits im 4. Jahrtausend im alten Elam bekannt gewesen sind; ich verweise insbesondere auf ein elamitisches Siegel (Mém. de la Délégation en Perse, XII, Paris 1911, Pl. IV, No. 172), das das Sternbild des Löwen unzweideutig mit 18 oder 19 Sternen darstellt, durchaus vergleichbar mit dem Löwen vom Grabmal des ANTIOCHUS VON KOMMAGENE und dem Sternkatalog des ERATOSTHENES, und ferner auf die zahllosen Darstellungen des Steinbocks mit dem Sonnensymbol in den Hörnern, die wir auf der prähistorischen persischen Keramik, auf elamitischen Siegeln, später auch ausserhalb Persiens antreffen, so u.a. auf einer Goldschale aus Ras Shamra (wiedergegeben in *Syria* XV (Paris, 1934, Pl. XV).

Harvard University. WILLY HARTNER.

E. S. Russell.—*The behaviour of animals, an introduction to its study.* viii + 184, EDWARD ARNOLD, London, 10/6; LONGMANS, GREEN & Co, New York, $4.20, 1934.

The work of Dr E. S. RUSSELL on animal behaviour is not as widely known in this country as it deserves to be. Dr RUSSELL is well known to general biologists by his work as Director of Scientific Fishery Investigations to the Ministry of Agriculture and Fisheries, and to a perhaps wider audience by those excellent books, *Form And Function* (London, 1916), and *The Interpretation Of Developement And Heredity* (Oxford, 1930). I do not, however, recall to have seen more than a very few references, in the relevant literature, to his studies on animal behaviour, chief among which, up to the present time, has been his book *The Study Of Living Things* (London, 1924), a work of the greatest originality, but one which Dr RUSSELL has himself always regarded as a sort of preliminary skirmish propaedeutic to a more intensive study of the problem. The present work represents the more intensive study.

Dr RUSSELL's emphasis in the study of animal behaviour is upon the *organism as a whole*, by the method of simple direct observation without speculative theory and analysis. He is opposed to the mechanistic interpretation of animal behaviour, the physico-chemical stimulus-response interpretation which, as he points out "excludes the possibility that the animal exhibits directive activity in relation to its needs, and that it responds to its own perceptual field, rather than to the separate physical and chemical stimuli which we discover as acting upon it." The organism must instead be studied as a whole, not as parts of such, but working from the whole to the parts, rather than from the parts to the

whole, for organisms do not function as parts but as whole entities, entities, moreover, in a spatio-temporal continuum.

The organism is regarded as an organized entity exhibiting the activities of maintenance, development, and reproduction, bound up in one continuous life-cycle, its activities being adaptively directed towards an end, which is the completion of the normal life-cycle. Behaviour is simply one form of the general directive activity of the organism. As such it does not require mind as an immaterial entity to explain it.

For the dualistic dichotomy of matter and mind the concept of the total organism is substituted. Thus, as Dr RUSSELL sees it, the study of animal behaviour is the study of the directive activity of the organism as a whole in so far as that activity has reference to the organism's own perceptual world. (See in this connection Dr RUSSELL's British Association Address *The Study Of Behaviour*, Nature, December 1st 1934).

This view of animal behaviour is brilliantly worked out in subsequent chapters, to each of which is appended a valuable list of references. In these chapters behaviour in relation to the distribution of animals, maintenance activities, characteristics of "instinctive" behaviour, instinctive behaviour in relation to development and reproduction, development of behaviour and learning, "insight" learning, and perception and Gestalt Theory, are considered. This last chapter is particularly recommended to those who have been grappling with Gestalt Theory. There is a good index to this very memorable book.

New York University. M. F. ASHLEY-MONTAGU.

A. C. Haddon.—*Reports of the Cambridge anthropological expedition to the Torres Straits.* Volume I, xiv + 421 pp. 11 Plates, 50 figs., 10 maps, 2 diagrams. *General ethnography.* Cambridge : At the University Press; New York : The MACMILLAN Co., 1935 ($14.00).

(The volumes previously published are as follows :

Vol. II, *Physiology and Psychology.* Pt. I, *Introduction and Vision.* By W.H.R. RIVERS, *Appendix* by C.G. SELIGMANN. 1901, $5.00, pp. vii + 140.

Vol. II, *Physiology and Psychology.* Pt. II, *Hearing, Smell, Taste, Cutaneous Sensations, Muscular Sense, Variations of Blood-Pressure, Reaction-Times.* By C.S. MYERS, W. MCDOUGALL. 1903, pp. ii + 141-223, $3.75.

Vol. II, *Physiology and Psychology.* Pt. III, *Physical Anthropology. To be published.*

Vol. III, *Linguistics.* Pt. I, *The Languages of the Torres Straits.* Pt. II, *The Languages of Cape York Peninsula, North Queensland.* Pt. III, *The Languages of British New Guinea.* Pt. IV, *The Linguistic Position of the*

Languages of Torres Straits, Australia, and British New Guinea. By SIDNEY H. RAY. 1907, pp. x + 528, $ 15.50.

Vol. IV, *Arts and Crafts. Introduction and Daily Life. Decoration of the Person and Toilet. Personal Ornaments and Clothing.* By A.C. HADDON. *Textiles.* By A. HINGSTON QUIGGIN. *Houses.* By A. WILKIN and A.C. HADDON. *Domestic Utensils and Tools. Food and its Preparation, and Narcotics. Horticulture. Hunting and Fishing. Weapons and Objects Employed in Warfare. Transport and Canoes.* By A.C. HADDON. *Science.* By A.C. HADDON, *including Astronomy* By W.H.R. RIVERS, *and a Calendar* By S.H. RAY. *Sound-Producing Instruments. Songs. Dances and Dance Paraphernalia.* By A. C. HADDON. *Greetings, Salutations, and Various Social Customs,* By S. H. RAY, A. C. HADDON and J. BRUCE. *Games and Toys.* By A. C. HADDON. *Decorative, Pictorial and Glyptic Art.* By A. C. HADDON. 1912, pp. xx iv + 393, 40 Plates, $ 14.00.

Vol. V, *Sociology, Magic and Religion of the Western Islanders. Introduction. Folk-Tales.* By A. C. HADDON. *Genealogical Tables. Genealogies. Kinship.* By W. H. R. RIVERS. *Totemism.* By A. C. HADDON and W. H. R. RIVERS. *Birth and Childhood Customs. Women's Puberty Customs.* By C. G. SELIGMANN. *Initiation. Courtship and Marriage.* By A. C. HADDON. *The Regulation of Marriage.* By W. H. R. RIVERS. *Funeral Ceremonies. Regulation of Public Life. Morals.* By A. C. HADDON. *Personal Names.* By W. H. R. RIVERS. *Land Tenure and Inheritance.* By A. WILKIN. *Trade.* By A. C. HADDON. *Warfare.* By A. C. HADDON and A. WILKIN. *Tales of the War-Parth.* By A. WILKIN. *Magic and Religion.* By A. C. HADDON, C. G. SELIGMANN, and A. WILKIN. 1904, pp. vi + 378, 22 Plates, $14.00.

Vol. VI, *Sociology. Magic and Religion of the Eastern Islanders. Introduction. Folk-Tales.* By A. C. HADDON. *Genealogies. Kinship. Personal Names.* By W. H. R. RIVERS. *Birth and Chilhood Customs, and Limitation of Children. Courtship and Marriage.* By A. C. HADDON. *The Regulation of Marriage.* By W. H. R. RIVERS. *Funeral Ceremonies.* By C. S. MYERS and A. C. HADDON. *Property and Inheritance.* By A. WILKIN. *Social Organization.* By W. H. R. RIVERS. *Trade. Quarrels and Warfare. Magic. Religion.* By A. C. HADDON. *The Cult of Bomai and Malu.* By A. C. HADDON and C. S. MYERS. *Mythical Beings.* By A. C. HADDON. 1908, pp, xx + 316, 30 Plates, $12.00.).

This volume (vol. I) marks the successful conclusion of a great venture in the history of anthropology, the full publication of the results of the first organized anthropological expedition for the study of a human group. Though this work constitutes volume I in a series of six volumes

it is last in order of appearance, the other five volumes — with the exception of Part III of volume II shortly to be published — having made their appearance between the years 1901 and 1912. Together the six volumes constitute one of the great landmarks of anthropological science, and as such it owes its being chiefly to the author of the present volume, for it was Doctor HADDON, the then occupant Chair of Zoology in the Royal College of Science, Dublin, who, following upon a visit to the Torres Straits in 1888 in the capacity of zoologist, realized the importance of the fast disappearing opportunities for the study of the human groups in this region, and as a consequence persuaded a group of young men to accompany him on an anthropological expedition to the Torres Straits. These young men were SIDNEY RAY, W. H. R. RIVERS, C. S. MYERS, W. Mc DOUGAL, C. S. SELIGMANN, and ANTHONY WILKIN. Rarely can a leader have been so fortunate in the choice of his co-workers.

WILKIN'S promising career was cut short by death at Cairo on May 17, 1901, — his name is enshrined in the pages of these volumes in a number of valuable studies from his pen and by a large number of excellent photographs, and is at Cambridge perpetuated by the ANTHONY WILKIN Studentship for ethnological and archaeological field-work.

W. H. R. RIVERS died suddenly at Cambridge on June 4, 1922, after a career of service to ethnology and psychology which has secured for him an enviable place in the history of anthropology. His field studies *The Todas*, London, 1906, and *The History of Melanesian Society*, Cambridge, 1914, together with his theoretical work *Kinship and Social Organization*, London, 1914, are already among those classics of the science which are indispensable to every student of anthropology. The importance of the Torres Straits Expedition for anthropology lies, among so many other things, in the discovery here made by RIVERS of the uses of the genealogical method as a technique of anthropological investigation. RIVERS' death in the prime of his life and powers was an irreparable loss both to his friends and his science.

RAY, MYERS, SELIGMANN, and MCDOUGALL are happily still with us and all energetically at work.

RAY is to-day the world's authority on the languages of Oceania; MYERS, after a long and fruitful career as an experimental psychologist is to-day among our greatest authorities on Industrial Psychology, and founder and Director of the institute by that name in London; Mc DOUGALL'S fame as a psychologist is too well known to require more than the briefest mention, whilst his ethnological work written in collaboration with the late CHARLES HOSE, *The Pagan Tribes of Borneo*, London, 1912, is one of the great books of ethnology. SELIGMANN has just retired from the Professorship at The London School of Economics,

University of London, following a conspicuously distinguished career which has served chiefly to illumine our knowledge of the peoples of the Sudan and Nilotic of North Africa, whilst his *The Melanesians of British New Guinea*, Cambridge, 1910, is a classic, as is also *The Veddas*, Cambridge, 1911, written in collaboration with his wife BRENDA.

Concerning the leader of the Cambridge Anthropological Expedition to the Torres Straits, the general editor and author of the majority of the studies in these volumes, the doyen of Britisch anthropologists, it may be fairly said than no man has done more for his science than ALFRED CORT HADDON has for anthropology in the British Empire. In 1895 HADDON published his first book on anthropology, a work entitled *Evolution in Art as illustrated by the Life History of Designs*, London, — and since that time he has produced studies and books innumerable on practically every branch of anthropology, — the last of these works, interestingly enough is also on fabrics and designs, namely *Iban or Sea Dayak, Fabrics and their Patterns*, written in collaboration with L. E. START, Cambridge, 1936. Last year HADDON published a book on the very topical subject of Race in collaboration with JULIAN HUXLEY, *We Europeans*, London and New York, 1936. This book was recently awarded a thousand dollar prize. To-day, HADDON is still busily engaged upon a variety of anthropological works the future success of which may he long be granted to enjoy.

The present volume is in many ways the most important of the volumes forming the *Reports*, since not alone does it provide a summary of the findings of the Expedition, but it also contains a full discussion of the general problems relating to the ethnography of the Torres Straits region, a discussion which takes full advantage of practically everything that has been written on the region down to the present day. In addition to this, a great deal of general ethnographic material here makes its appearance for the first time, and this is of a very high order. Whilst for detailed reference the earlier five volumes will always remain a necessary adjunct of the ethnologist's laboratory, it is safe to say that the present volume will alone form an indispensable part of the equipment of all future students of the general ethnography of the Torres Straits region. Professor HADDON is to be felicitated upon bringing this monumental and magnificient work to so happy a conclusion. The contents of this volume are as follows :

Vol. I, *General Ethnography*. Pt. I, *Historical Sketch. Geography and Geology. The Ethnography of the Various Islands.* Pt. II, *Ethnography of Neighbouring Areas.* Pt. III, *General Ethnography of Torres Straits.*

The whole volume from beginning to end is by Doctor HADDON. It is in itself a mine of information and a monument of industry.

There is no index, but this is no serious disadvantage since the whole work is so organized that an index would really be a work of supererogation. There is a short select bibliography, other bibliographical references are distributed throughout the work.

New York University. M. F. ASHLEY-MONTAGU

James G. Leyburn.—*Frontier folkways.* x + 291 pp. New Haven : Yale University Press, 1935, ($3.00).

In the year 1920 Professor FREDERICK JACKSON TURNER published a volume entitled *The Frontier in American History*, (New York), a work which has had a profound influence upon American historical studies, for it was in this work that the great influence of the frontier upon the development of North America was for the first time really thoroughly demonstrated. In 1928 *The American Indian Frontier* (New York) by Professor WILLIAM CHRISTIE MACLEOD made its appearance, a most excellent volume which treated the subject more particularly from the viewpoint of the Indian side of the frontier development, and now in the present important work by Professor JAMES LEYBURN we are treated to a study of the frontier which is at once more general and particular than either of the two foregoing volumes. Professor LEYBURN is concerned with the question : What happens to man's institutions when he goes to a frontier?

The frontier is broadly defined "as that region on the outer fringe of settlement where pioneers are forced, for the sake of survival, to make new adjustments to a new environment. It is a region, it is a process, it is even a state of mind." (p. 1). And it is this process, this state of mind that Professor LEYBURN surveys in such regions as Massachusetts Bay, the St. Lawrence River, New Zealand, Brazil, the Transvaal, Australia, and Java, each one of which he treats as a case history.

The general conclusions which emerge from this survey are that, first, the task of the pioneer being to make it possible for himself to exist, "it is in the mores of economic maintenance that changes in the mores are first evidenced and most strongly marked." (p. 229). But even more important than this is the light which this study throws upon a fact which is easily overlooked in the study of any culture, namely, that the life of a people basically grows out of the environment in which it develops. It is one of the chief merits of this book that this fact is made to appear so clearly in each of the case histories presented. Professor LEYBURN, however, is dealing with fairly advanced cultural groups, he is not, in this book, concerned with primitive societies, although he has not failed to notice the parallels which appear to exist between the social functioning of the frontier communities and that of primitive communities

under conditions which are not dissimilar. Second, Professor LEYBURN shows that the interaction of such factors as the religion and the traditions which the pioneers brought with them played a very considerable part in determining their ability to make a success of things. The important point is, however, that whilst they succeeded in harnessing the new environment to their needs, in the process of so doing their concessions to the new environment may well be said to have enslaved them to it. And thereby hangs a tale! Professor LEYBURN has written an important and fascinating volume for which all students of man must be grateful.

New York University. M. F. ASHLEY-MONTAGU.

Gregory Bateson.—*Naven, a survey of the problems suggested by a composite picture of the culture of a New Guinea tribe drawn from three points of view.* xix + 296 pp., 28 Plates. Cambridge : At the University Press; New York : The MACMILLAN Co., 1936 ($ 7.00).

Science and its methods together with all the variety of techniques it employs is characterized by a single purpose, namely, the eduction of the relations which exist between things. Whether we are dealing with the physical properties of bodies in a certain space-time continuum, or with the behaviour of individuals in particular communities, we are in each case concerned to discover the relations existing between the events which constitute the material, psychological or cultural complex that we are attempting to understand. The methods of mathematical physics have been finely developed to uncover and to test the relations which exist between events in the physical universe, and it so happens that the method of the mathematical physicist is of such a nature as to render it obligatory that the variables with which he has to deal, though theoretically infinite, must always be reduced to a small and manipulable number. The success which has attended the method of the mathematical physicist has led some students to the assertion that no method is a scientific method unless it approximates to the method of mathematics, that mathematics is the only true method of measurement, and that since there can be no science without measurement there can be no science without mathematics. KELVIN, PEARSON, and many others have somewhat pontifically delivered themselves of this egregious judgement, for which there seems to be no other foundation than that having themselves been so long preoccupied with mathematical processes they have come to see the whole world through mathematical spectacles. Misled by the judgment of these great figures of science social scientists have attempted to give their somewhat loose disciplines an appearance of scientific thoroughgoingness by the introduction of statistical methods

in the analysis of their variables, variables whose chief claim upon the attention of the student is an infinite variability and a history more complex and complicating than any that the most complex physical structure can boast of. TYLOR many years ago, and KROEBER within recent years, have tried the mathematical analysis of cultural phenomena, but without much success. The psychologists are only just beginning to discover that the statistical evaluation of their data is not an end but a means, and a subservient means among others, to an end, — the eduction of relations, that the investigator's opinion is often worth more than anything that comes out of a calculating machine.

In the study of social phenomena it is in general quite impossible to apply any rigidly determined method of investigation owing to the enormous variability of the variables with which one has to deal, variables which are never the same in different communities, and which even in the same community are always in process of undergoing dynamic change, and the relations of which are practically unlimited. In the study or such dynamic cultural changes there is, however, one method which may be utilized in a systematic and universally valid manner, and that is the method of recording observed facts within the context in which they occur, in short, the historical method, which in the field of ethnology is associated with the name of FRANZ BOAS. In this sense ethnology would be a descriptive science in much the same way as macroscopic or gross anatomy is a descriptive science, and indeed the historical descriptive aspect of ethnology, the complete or even partial description of the cultures of different peoples, is the fundament of ethnological procedure upon which the science must stand. As in the majority of the sciences good observation, which should be equivalent to the good description of one's observations when they come to be written down, is of paramount importance in ethnology. It is impossible here to enter upon a discussion of the nature of observation, but most scientists will not need to be told how fundamental and how complex a process observation is. Ethnology is, however, much more than an observational descriptive science, for it is analytic, synthetic, and classificatory, — but observation remains its fundamental process. The present book by Mr. GREGORY BATESON is the confession of a young ethnologist's struggle with the problem of observation in the field; as such it is very revealing, not so much of the cultural processes of the Iatmul people of New Guinea as of the mind and temperament of the author. A document so self-immolatingly ingenuous as this confession of confusion accompanied by an account of the victim's attempts to extricate himself from the morass in which he found himself cannot but fail to win the reader's sympathy, even though he may find little to admire in the process unless it be his

own perseverance in following the author over a course which often billowy is too frequently flat. For a book of this kind to be successful a sense of humour is a *sine qua non*, yet the book is completely humourless, and this is unfortunate. There is one passage in which the author writes that "on theoretical grounds, we must expect that if the course of true love ever ran smooth, it would follow an exponential curve," (p. 197), but we cannot be sure whether Mr. BATESON here had a twinkle in his eyes, since there is no evidence that his eyes (or eye) twinkled elsewhere in his book. If HOOKHAM FRERE and CANNING were alive to-day there might here be material for an additional stanza on *The Loves of the Triangles*.

Mr. BATESON tells us in his Foreword that Dr. HADDON first made him an anthropologist telling him in a railway train between Cambridge and King's Lynn that he would train him and send him to New Guinea. After, it is presumed, some preliminary training Mr. BATESON went out to New Britain in 1929 for some months where he studied the Sulka people. Later he made two expeditions to the Iatmuli tribe on the Sepik River, New Guinea, and this book represents " a survey of the problems suggested by a composite picture of the culture of a New Guinea tribe drawn from three points of view," and revolving about the ceremonies of *naven*, ceremonies during which, most importantly, the sexes attire themselves in the clothes customarily worn by the opposite sex. The chief function of these ceremonies is to secure for the *wau* (mother's brother, son's wife's brother, and other relatives classified with them) the allegiance of the *laua* (sister's child, sister's husband's father, and other relatives classified with them). The first half of the book is devoted to an examination of the *wau-laua* relationship and all its ramifications. After a very careful reading of the book I confess to having no very clear picture of the nature of this relationship or its ramifications. It is possible that a clear picture could be obtained following a closer study of the book than I have been able to give it, but in fairness to the author it should be stated that he is himself aware of the lack of definiteness to the picture which he has tried to paint. Actually, his chief purpose is not so much the conveyance of any picture, in the present book at least, as to use certain ceremonies, the *naven*, as a peg upon which to hang a particular theory, and it is in this theory that the real importance of his book lies. The real purpose of this book, as he says, is "to suggest methods of thinking about anthropological problems," (p. 260). The concepts *structure*, *ethos*, *eidos*, and *schismogenesis*, by no means new, are made by Mr. BATESON to do good service in the cause of his theory. "When a culture" writes Mr. BATESON "is considered as a whole certain emphases emerge built up from the juxta-

position of the diverse traits of which the culture is composed." (p. 113). The content of these emphases are conceived to be either *systems of thought* or *scales of value*. The analysis of these *systems* and *scales* is carried out by means of the instrumental concepts above mentioned. It is quite impossible within the bounds of this review to enter into a critical discussion or exposition of Mr. BATESON's analysis. His method is essentially histological, and I find myself in the position of having a great deal to criticise, much to praise, much to point out that is definitely awry, and neither the time nor the space (for it would require a book larger than Mr. BATESON'S) to do it in. I shall therefore conclude this review by giving thanks that Mr. BATESON has not read PARETO and recommend his very unusual book to those who may be interested in a discipline, not to mention an ethnologist, in the throes of becoming scientific.

New York University M. F. ASHLEY-MONTAGU

Carlton J. H. Hayes.—*A political and cultural history of modern Europe.* Vol. 1, xviii + 863 pp. Vol. 2, xiv + 1215 pp. New York : The MACMILLAN Co., 1936, ($10.00).

In 1932 Professor HAYES published a completely rewritten and reorganized version of his well-known *Political and Social History of Modern Europe* under the modified title which the present work bears, with the sub-title *Three Centuries of Predominantly Agricultural Society*, 1500-1830. With the publication of the second volume with the sub-title *A Century of Predominantly Industrial Society*, 1830-1935, the work is now brought to a conclusion, and issued by the publishers in a uniform format as a set, though each volume is in itself a complete work. The second volume is an entirely new work, and it is admirable. Written in a liberal spirit, the author makes it clear that the work is "planned mainly though not exclusively as an introductory survey for college students," and so intended there can be no doubt that it will serve the college student and the general reader well. The work is avowedly not intended for the specialist, though I cannot imagine the specialist who would not profit from a reading of these volumes.

In a work of this size and scope in which the author ranges over so much and so much, from art to zoology, the specialist — whatever his subject — will find a certain number of things which he could have wished more accurately or otherwise stated. It is quite evident, to take but one example, to anyone familiar with the genesis of Impressionistic painting that the author's account of that subject is considerably awry, and it may be that Professor HAYES did not devote the amount of time to the study of this subject which the specialist may feel that the college student and the general reader had a right to expect from the author.

But so to feel would be neither correct nor fair, for Professor HAYES shows a wide familiarity with modern art as is borne out not alone by his text but also by the taste with which the illustrations to these volumes have been selected, and if he has failed to discover the real chain of events which led to the birth of the new movement, that is perhaps no serious fault in a general historian who is chiefly concerned to state his facts in terms of historic events rather than in those of analytic relations. The sections dealing with science are remarkably good, though even here it would be possible to criticize.

By no means perfect, Professor HAYES' book is nonetheless among the best of its kind. The style is clear and easy, and there is hardly a phrase in the whole of the six hundred thousand and more words of this book that grates upon the ear, in itself no small achievement. The select bibliographies run to fifty pages of closely printed matter, and these are calculated to assist the student to read more intensively in those fields in which he may be interested. The numerous illustrations, maps (many of them coloured) and tables, should prove of great value to the student and general reader, and the text cannot but help him to see the society in which he lives somewhat plainer.

New York University. M. F. ASHLEY-MONTAGU.

Raymond Klibansky & H. J. Paton (*editors*).—*Philosophy and history.* Essays presented to ERNST CASSIRER. xii + 360 pp. New York : Oxford University Press, 1936 ($8.50).

To Professor ERNST CASSIRER on the occasion of his sixtieth birthday this volume was presented by the twenty-three contributors who give it substance and form. The book, as its title implies, presents as its central theme the connection between philosophy and history, and although each contributor approaches this many-faceted theme from a wholly different viewpoint, and whilst necessarily the consequent disconnection between the content of the contributors does not make for consecutive reading there is nonetheless a certain consistency to the book if only in the singleness of the problems it raises. The editors believe that the subject is a complex one, and approached from the metaphysical standpoint it is not to be doubted that it is — this volume is ample enough proof of that fact. Not all the contributors to this volume are of the school of Neo-Kantian Idealism to which CASSIRER belongs and of which he is the leader, yet most of the contributions are strongly tinged by an Idealistic *Anschauung* which would naturally from the methodologist's standpoint appear to vitiate much of their value. This is not to say that any one of these contributions is not interesting, stimulating, and

even pleasant reading, but this *is* to say that from the point of view of one who takes, or endeavours to take, a large view of the relation between philosophy and history, few of these essays would be considered satisfactory statements of the problems it is sought to solve, although from another standpoint taken together they may be so considered since collectively they serve to show the inadequacies of the metaphysical approach. It is perhaps significant in this connection that not one of the contributors to the present volume even so much as mentions ARNOLD J. TOYNBEE'S superlative *A Study of History* (Oxford, 1934) of which three volumes have thus far been issued, for TOYNBEE'S approach to history is that of a Realist, or perhaps better, that of a humanist. Had the editors have had it within their power to determine the distribution of the subjects treated by their contributors they would doubtless have sought to remedy this condition. Professor PATON, at any rate, is well acquainted with TOYNBEE'S work, and it is much to be regretted that there is no article from his pen in this volume.

The really great deficiencies of this volume are the absence of a portrait of CASSIRER, and of a short biographical account of his life and achievements, for if ever there was a man who could bear having both his image reproduced and his achievements recounted that man is ERNST CASSIRER. It has long been a matter for wonder that a thinker of such originality, soundness, and brilliance, of so wide a range of interests, should have had so little influence upon English-speaking, or possibly it would be more accurate to say, English-*thinking* thinkers. Up to 1923 only one of CASSIRER'S works had been translated into English, namely ***Substance and Form*** : ***and*** EINSTEIN'S ***Theory of Relativity*** (Open Court Publishing Co., Chicago), one of the most remarkable philosophical works of our century. For the rest CASSIRER is represented in the ***Encyclopaedia Britannica*** (1928) and in ***The Encyclopaedia of the Social Sciences*** (1931 — wrong date, 1911, given in the present volume, p. 343) by a number of articles, but this is the limit of CASSIRER'S representation in English garb, and this perhaps reflects something of the nature of his influence and popularity among English-*thinking* thinkers ! It does, however, appear that CASSIRER'S great masterpiece ***Philosophie der symbolischen Formen*** (Berlin, 3 vols, 1923-1929) is beginning to be read by thinkers outside the now more than ever narrow bounds of Germany, for in Germany no one dares to read CASSIRER owing to the clearly pertinent fact that CASSIRER is of Jewish origin, an offence which caused him to be removed from the Chair of Philosophy at Hamburg, — (following a sojourn at Oxford CASSIRER is now happily established at Göteborg in Sweden). It is to be hoped that the present volume will do much to draw attention to the work of CASSIRER, and if it succeeds in doing so it will have more than

justified its immediate purpose and its value in its own right will be a thousandfold enhanced. *In hoc signo vinces.*

The contents of the volume are as follows :

J. HUIZINGA, *A definition of the Concept of History.* S. ALEXANDER, *The Historicity of things.* L. BRUNSCHVIGG, *History and Philosophy.* G. CALOGERO, *On the so-called Identity of History and Philosophy.* C.C.J. WEBB, *Religion, Philosophy, and History.* E. GILSON, *Concerning Christian Philosophy. The Distinctiveness of the Philosophic Order.* B. GROETHUYSEN, *Towards an Anthropological Philosophy.* G. GENTILE, *The transcending of Time in History.* L. S. STEBBING, *Some Ambiguities in Discussions Concerning Time.* T. LITT, *The Universal in the Structure of Historical Knowledge.* F. MEDICUS, *On the Objectivity of Historical Knowledge.* E. BREHIER, *The Formation of our History of Philosophy.* E. HOFFMANN, *Platonism in Augustine's Philosophy of History.* L. LÉVY-BRUHL, *The Cartesian Spirit and History.* F. SAXL, *Veritas Filia Temporis.* E. PANOFSKY, *Et in Arcadia Ego.* E. WIND, *Some Points of Contact between History and Natural Science.* H. J. POS. *The Philosophical Significance of Comparative Semantics.* F. GUNDOLF, *Historiography.* J. ORTEGA Y GASSET, *History as a System.* R. KLIBANSKY, *The Philosophic Character of History.* R. KLIBANSKY & W. SOLMITZ, *Bibliography of* E. CASSIRER'S *Writings.* L. LABOWSKY, *Index.*

There is a list of subscribers at the end of the volume following the Index (why so?) consisting of the names of 66 individuals, 6 firms and 35 libraries. Without wishing to appear ungracious I cannot help but believe that had the editors have exercised a little more energy a large number of scholars the world over who are CASSIRER'S admirers would have availed themselves of the opportunity which was apparently never offered them, of doing CASSIRER honour by subscribing to this volume. It now remains open to them to do so by subscribing in the ordinary way to this volume. The book is well printed and bound, and is illustrated by sixteen plates.

New York University. M. F. ASHLEY-MONTAGU.

Emmanuel Leclainche.—*Histoire de la médecine vétérinaire.* XV + 812 pag. Toulouse, Office du Livre, 1936. (100 fr.)

L'histoire de l'art vétérinaire est fort intéressante non seulement du point de vue technique, mais aussi du point de vue social. Ce sont les préjugés platoniques d'abord, puis chrétiens qui ont rejeté le vétérinaire en dehors de la société médicale. Les animaux n'ont point d'âme et par conséquent la même médecine ne peut s'appliquer à eux et aux êtres humains ; les médecins des bêtes partagèrent le mépris qu'inspiraient leurs pauvres malades. La politique de l'Eglise en cette

matière fut sans doute déterminée en partie par la crainte des hérésies d'Orient (p. viii) :

" C'est la vie et son mystère que révère la philosophie de l'Asie. Principe divin, elle sanctifie tous les êtres; elle confond l'homme et l'animal pour une même destinée. Il n'y a qu'une médecine dans l'Inde, et peut-être en serait-il partout de même aujourd'hui si le Bouddha avait régné sur le monde. Pour mieux affirmer l'absolutisme de ses dogmes, l'église chrétienne exagère son mépris pour l'animal et elle ira jusqu'à lui refuser l'aumône de sa pitié."

Quoiqu'il en soit, depuis la fin de la période antique jusqu'à la fin du XVIII[e] siècle, l'art vétérinaire a été constamment méprisé en occident et a dû se développer d'une manière assez précaire, sans doctrine et sans docteurs. Il en résulte que son histoire est fort difficile à rédiger, et l'on doit être reconnaissant à l'auteur pour les peines qu'il s'est donné.

Son œuvre est divisée en deux parties inégales : la partie ancienne qui s'étend jusqu'à la fondation des Ecoles (227 p.), et la partie moderne (585 p.). Les premières Ecoles vétérinaires furent celles de Lyon 1763, Alfort 1766, Turin 1769, etc. Voir la liste chronologique, pp. 237-8. Vingt-trois écoles (dont quinze subsistent) furent fondées dans la seconde moitié du XVIII[e] siècle ; cependant la période moderne, à laquelle près des trois quarts du livre sont consacrés, est en grande partie postérieure à la Révolution. Certaines idées nouvelles datent du XVIII[e] siècle, les grandes réalisations du XIX[e].

Les vétérinaires s'intéresseront surtout à la partie moderne, tandis que les historiens de la science liront plutôt les trois chapitres consacrés à l'antiquité, le moyen âge, et la renaissance (la " renaissance " de l'auteur s'étend du XII[e] au XVIII[e] siècle). Cette partie est malheureusement la moins originale, mais l'auteur paraît avoir fait bon usage des histoires antérieures. Enumérons les principales de celles-ci :

FRIEDRICH EICHBAUM : *Grundriss der Geschichte der Thierheilkunde* (viii + 328 p., Berlin 1885), surtout bibliographique.

AUGUST POSTOLKA : *Geschichte der Thierheilkunde von ihren Anfängen bis auf die Jetztzeit* (2te verm. Aufl., x + 399 p., Wien 1887).

LÉON MOULÉ (1849-1922) : *Histoire de la médecine vétérinaire* (4 parties, 683 p., Paris 1891-1911), jusqu'au XVI[e] siècle.

Sir FREDERICK SMITH : *The early history of veterinary literature and its British development* (iv + 373 p., 27 fig., London 1919 ; *Isis* 3, 307). L'auteur remarque que cet ouvrage est à peu près introuvable. Cela n'est guère étonnant, car il n'en fut publié que cinquante exemplaires, mais on peut en trouver la substance dans le *Journal of comparative pathology and therapeutics* de 1912 à 1918. Le major général Sir FREDERICK SMITH et l'auteur sont à peu près contemporains. Celui-ci est né à Piney dans l'Aube, en 1861 ; il est membre de la section d'économie

rurale de l'Académie des sciences depuis 1911. Sir FREDERICK, né en 1857, a fait sa carrière vétérinaire dans l'armée anglaise. En plus de l'ouvrage cité plus haut il a écrit deux autres histoires vétérinaires : *A veterinary history of the war in South Africa* 1899-1902 (viii + 321 p., ill., London 1919) ; *A history of the Royal army veterinary corps*, 1796-1919 (xi + 268 p., 13 pl., port. London 1927). Il est mort en 1929.

De plus l'auteur a utilisé les travaux plus récents de la nouvelle école allemande représentée par la *Gesellschaft für Geschichte und Literatur der Veterinärmedizin* et dirigée par REINHARD FRÖHNER et WILHELM RIECK. Les noms de ceux-ci ont été bien souvent cités dans *Isis*, quoique je n'aie pas l'occasion d'examiner leurs périodiques, les *Veterinärhistorische Mitteilungen* et le *Veterinärhistorisches Jahrbuch* (1925 sq.) qui sont un peu trop éloignés de mes préoccupations habituelles.

En dépit de tout cela la partie ancienne de l'ouvrage est plutôt maigre. Sans doute satisfera-t-elle les vétérinaires même les plus érudits, mais les historiens de la science sont plus difficiles. J'ai examiné la partie médiévale, dérivée de MOULÉ et SMITH, et cependant fort insuffisante. Par exemple, voici ce qu'il nous dit de BONIFACE (p. 137) :

" BONIFACE est un médecin de Gerace, en Calabre. Il vivait, d'après HEUSINGER, sous le règne de CHARLES D'ANJOU, roi de Sicile (1266-1285), tandis que SMITH estime qu'il est né pendant la vie ou peu après la mort de RUFFUS. Une copie de sa *Marescalcaria del cavallo*, écrite en grec et traduite en italien par le dominicain ANTONIO DRAPERA (sic), se trouve au British Museum; elle est ornée de sept beaux dessins coloriés. Le texte, sans originalité, est gâté par des considérations astrologiques."

S'il avait examiné ce MS. il aurait remarqué que les illustrations en sont fort instructives. Il y a d'ailleurs toute une série de MSS. analogues—à Naples, Mannheim, Wolfenbüttel et dans la collection Pierpont Morgan à New York, qui mériteraient de faire l'objet d'une étude comparative. J'ai examiné moi-même le beau MS. de New York il y a quelques années (1), et j'ai appris que Miss HARRSEN attachée à la Morgan Library, a rassemblé des photographies de toutes les illustrations ; il serait donc possible de faire cette étude à New York dans de fort bonnes conditions. La méthode iconographique n'a pas encore été suffisamment exploitée par les historiens de la science médiévale,

(1) Il faudrait étendre la comparaison aux mss. arabes, par exemple celui de AḤMAD IBN ḤASAN IBN AL-AḤNAF, daté 1209, récemment publié par REINHARD FROEHNER (Hauptner-Instrumente, Neuheiten 1936, pp. 39-56, Berlin; *Isis* 28) et au manuscrit espagnol de JUAN ALVAREZ SALAMIELLAS (XIII^{e} siècle; *Introduction* 2, 1091), dont plusieurs illustrations ont été reproduites par WILHELM RIECK : *Das Veterinär-Instrumentarium im Wandel der Zeiten* (Berlin, Firma H. HAUPTNER, 1932; *Isis* 28).

sauf quelques-uns, tels que SUDHOFF, SINGER, KLEBS et HUNGER. (2)

La partie arabe est non seulement très insuffisante, mais l'auteur ne s'est donné aucune peine pour écrire les noms et les mots arabes proprement. Cela est tout à fait inexcusable. Il ne manque pas d'arabisants en France qui auraient pu l'aider et corriger des barbarismes tout à fait grossiers, tels que Abd ul-Kassim, Abour-Bekr, etc. Quand on écrit *djemr* pour l'anasarque, pourquoi écrire sur la même page (p. 118) *wag'kiljateir* pour l'hématurie? Le premier de ces mots devrait être écrit *wadj'*, quant au second je ne puis l'identifier. La médiocrité de la partie arabe est d'autant plus regrettable, que l'art vétérinaire (3) s'était fort développé dans les pays d'Islam.

L'ouvrage est admirablement publié mais sa valeur est fort diminuée par l'absence d'illustrations et de bibliographie, et l'absence d'index est tout à fait impardonnable.

GEORGE SARTON.

(2) Voir mon *Introduction* (2, 1093, 1931).

(3) La *ṣinā'at al-baiṭār*, d'où le mot espagnol *albeiteria*. Voir mon *Introduction* (vol. 2, 89).

Fiftieth Critical Bibliography

of the

History and Philosophy of Science and of the History of Civilization

(*to end of February* 1937—*with special reference to mathematics*)

This fiftieth Bibliography contains about 265 items of which 44 deal with mathematical generalities. They have been kindly contributed by the seven following scholars belonging to four different countries:

C. W. ADAMS (Hertford, England)
J. PELSENEER (Brussels)
T. L. DAVIS (Cambridge, Mass.)
G. SARTON (Cambridge, Mass.)
C. D. LEAKE (San Francisco)
M.C.WELBORN (Cambridge, Mass.)
LUCIEN LEROUX (Paris).

This Bibliography includes as usual a series of addenda and errata to SARTON's *Introduction to the History of Science*, vols. 1 and 2 (Baltimore and London, 1927 and 1931). Its purpose and methods have been explained in the preface to the thirty-eighth Critical Bibliography (*Isis* 20, 506-08).

The mathematical section (20) is especially full, as I have liquidated as much as I could of my stock of notes concerning it.

I have in my drawers a large number of notes which I will be glad to publish as soon as I have been able to check them upon the originals.

I entreat the authors of relevant books and papers to send me copies of them *as promptly as possible* in order that their studies may be registered in this bibliography and eventually reviewed and discussed. By so doing they will not simply help me and every other historian of science but they will help themselves in the best manner for they will obtain for their work the most valuable publicity and its certain incorporation into the literature of the subject.

Many of the notes were checked and the final manuscript and proofs of this Critical Bibliography were kindly read by Dr. M. C. WELBORN.

Harvard Library, 185
Cambridge, Mass.

GEORGE SARTON.
March 3, 1937.

PART I

FUNDAMENTAL CLASSIFICATION (CENTURIAL)

IVth century B. C. (whole and first half)

Mueller, Gustav E. What PLATO thinks. vi + 128 p. La Salle, Ill. Open Court, 1937 ($ 1.60). ISIS

" The following approach to PLATO treats him as a contemporary thinker. The sequence of the seven chapters is guided by a natural order of philosophical problems, which at the same time, corresponds to the main phases of PLATO's development. Beginning with the self-justification of philosophy as an intellectual and personal necessity, this leads to the understanding of the existential philosophical personality, to SOCRATES. The phenomenal world is treated under the term Soul, which in turn, introduces ethical philosophy, the Golden Mean, in distinction from wisdom, and leads further to the philosophy of beauty, art, and artist. Finally, dialectical idealism as the logic of philosophical thinking and the religious problems, preponderant in his later works, are presented."

IVth century B. C. (second half)

Barber, G. L. The historian EPHORUS. xii + 190 p. Cambridge, University Press, 1935. ISIS

Reviewed by M. F. ASHLEY-MONTAGU, *Isis* 26, 157-8, 1936.

Cumont, Franz. Regula PHILIPPI ARRHIDAEI. *Isis* 26, 8-12, 1936. ISIS

" Qu'elle doive son titre au roi PHILIPPE ou à l'astronome PHILIPPE, l'œuvre dont un hagiographe de l'époque carolingienne nous révèle seul l'existence, remonterait à la seconde moitié du IV^e^ siècle avant notre ère. Elle prendrait place parmi les écrits de ces premiers platoniciens qui enseignèrent à la Grèce la science des astronomes ' chaldéens.' Ce canon serait une première tentative pour déterminer, suivant le calendrier luni-solaire des Grecs, le retour des éclipses, avant qu'HIPPARQUE, par une connaissance plus exacte des parallaxes, arrivât à prédire par le calcul le moment précis où ce phénomène devait se produire en un lieu déterminé de la terre."

IIIrd century B. C. (whole and first half)

Becker, Oskar. Die Lehre vom Geraden und Ungeraden im Neunten Buch der Euklidischen Elemente (Versuch einer Wiederherstellung

in der ursprünglichen Gestalt). *Quellen und Studien zur Geschichte der Mathematik*, Abtg. B : Studien, 3, 533-53, 1 fig., 1936. ISIS

Ist century (second half)

Thorndike, Lynn. Epitomes of Pliny's Natural history in the fifteenth century. *Isis* 26, 39, 1936. ISIS

IInd century (second half)

Walsh, Joseph. Galen's writings and influences inspiring them. *Annals of medical history* 9, 34-61, 1937. ISIS

IXth century (second half)

Ruska, Julius. Al-Rāzī's Buch Geheimnis der Geheimnisse. Mit Einleitung und Erläuterungen in Deutscher Übersetzung. *Quellen und Studien z. Gesch. d. Naturw. u. d. Med.* 6, xiii + 246 p., 5 fig. Berlin, 1937 (RM. 38.80). ISIS

Ruska's translation of that work was long expected. We are very glad to have it. It is a fundamental addition to our knowledge of Arabic alchemy. A review of it will appear later in *Isis*. G. S.

Winderlich, Rudolf. Ruska's researches on the alchemy of Al-Razi. *Journal of chem. education* 13, 313-15, 1936. ISIS

XIIth century (whole and first half)

Scalinci, Noè. Le caratteristiche culturali dell'opera di Benvenuto Grasso, medico-oculista Salernitano. *Rivista di storia delle scienze mediche* 27, 424-28, 1936. ISIS

XIIth century (second half)

Corner, George W. On early Salernitan surgery and especially the "Bamberg surgery." With an account of a previously undescribed manuscript of the Bamberg surgery in the possession of Dr. Harvey Cushing. *Bulletin of the institute of the history of medicine* 5, 1-32, 5 pl., 1937. ISIS

Creutz, Rudolf. Der Magister Salernus Aequivocus und sein "Compendium Salerni." *Quellen und Studien zur Gesch. der Naturwissen schaften und der Medizin* 5, H. 4, 1-37, 1936. ISIS

Rodin, Frank H. MOSES MAIMONIDES, great physician, scientist, and philosopher. *Calif. and West. Med.*, 44, 192-96, 1936. ISIS

Good account of life and work of MAIMONIDES (1135-1204). Notes existence of a manuscript roll in the Sutro Collection of the California State Library in San Francisco, which corresponds in every detail with a description left by MAIMONIDES of a scroll of the law written by him.
C. D. L.

Ünver, A. Süheyl. La science médicale et habilité des médecins célèbres par NIZAMII ARUZÎ de Samarkand, savant et médecin Turc, 81 p. Istanbul, Cumhuriyet Matbaasi, 1936 (en Turc). ISIS

Turkish translation with commentary of the *Chahâr maqâla* written in Persian c. 1150-60 by NIẒÂM-I-'ARÛḌÎ AL SAMARQANDÎ (*Intr.* 2, 363) well known to English orientalists because of E. G. BROWNE's translation (*J. R. A. S.* 1899). G. S.

XIIIth century (second half)

Thorndike, Lynn. Paravicus : a misprint, not a translator. *Isis* 26, 33-6, 1936. ISIS

Correcting a mistake found in various books including SARTON's *Introduction* (2, 33). Paravicus is a misprint for Patavinus, " the Paduan." The *Taisîr* of IBN ZUHR was translated into Latin, not by one Paravici, but by a master of medicine of Padua. G. S.

Wickersheimer, Ernest. Un médecin d'hôpital thermal au XIII^e^ siècle. *Janus* 40, 241-43, 1936. ISIS

" Dans un précédent travail, j'ai montré qu'au moyen âge le service de santé des établissements hospitaliers était bien plus développé qu'on ne l'admet généralement. Voici un exemple assez particulier de médecin d'hôpital à cette époque. Il s'agit d'un hôpital thermal fondé sous le vocable de Notre-Dame par CHARLES II, roi de Naples, et au service duquel ce prince attacha, en 1299, un certain maître JOHANNES DE SYMONE, physicien, lui attribuant un traitement annuel de 12 onces d'or pour visiter les malades dudit hôpital, pour les conseiller et les diriger dans l'usage des eaux. Le document n'est pas inédit, mais, bien qu'il ait été connu de SALVATORE DE RENZI qui y a fait une brève allusion, il ne paraît pas avoir attiré, autant qu'il le mérite, l'attention des historiens de la médecine, ni de ceux de l'hospitalisation, ni de ceux de la balnéologie. J'ai donc jugé intéressant de le reproduire d'après la publication qui en a été donnée, il y a plus d'un demi-siècle, par un érudit italien."

XIVth century (whole and first half)

Stamm, Edward. Tractatus de Continuo von THOMAS BRADWARDINA. *Isis* 26, 13-32, 1936. ISIS

Apropos of an unpublished MS of the Thorn library. "Nachdem ich den Inhalt der Handschrift genau untersucht hatte, bin ich zur Überzeugung gekommen, dass er einen recht grossen Wert nicht nur deshalb besitzt, weil BRADWARDINA der grösste englische Mathematiker des XIV. J. genannt werden muss, sondern auch deshalb, weil sein 'Tractatus de Continuo' mit mathematischen und naturwissenschaftlichen Ideen des Mittelalters eng verbunden erscheint, Ideen, welche auf die spätere Entwickelung der Mathematik mächtig eingewirkt hatten, und was noch für uns sich interessanter zeigt, Ideen, welche mit heutigen Untersuchungen über das Wesen der Unendlichkeit und Stetigkeit, innig zusammenhängen. Ich beschloss deshalb den ganzen Text des Traktats zu veröffentlichen, und sah sich nach anderen Exemplaren um. Die diesbezüglichen Nachforschungen in einigen grösseren Bibliotheken hatten nicht viel gebracht; nur in Erfurt fand sich noch ein Exemplar des 'Tractatus,' ohne Namen des Verfassers und ohne Schluss, und zwar in der Stadtbibliothek zu Erfurt. Auf Grund dieser beiden Handschriften stellte ich den kritischen Text zusammen, welcher in nächster Zeit wird veröffentlicht werden." Follows an analysis and discussion of the text. G. S.

XIVth century (second half)

Lange, H.; Nippoldt, A. Die Deklination am 20. Mai 1380 in London. *Quellen und Studien zur Geschichte der Naturwissenschaften und der Medizin* 5, H. 4, 38-56, 1936. ISIS

"1. Die Stellung der Venus ist von CHAUCER als magnetisches Azimut gemeint, 2. aus dem im Jahre 1380 nördlichsten Stand der (untergehenden) Venus ist eine Missweisung von rund 23 1/2° zu erschliessen, 3. dieser Wert passt gut in die Extrapolation der Londoner Reihe der Missweisung hinein; 4. und spricht damit für die Tatsächlichkeit einer Periode der Säkularvariation der Deklination von 477 Jahren."

XVth century (whole and first half)

Alberti, Leon Battista (1404-1472). De re aedificatoria libri decem. Translated by V. P. ZOUBOV. With a fragment of an anonymous biography, translated by F. A. PETROVSKI. Vol. I, Text. xxix + 391 p., 2 port., facs., figs. (Classics of the theory of architecture). Moscow, All-Union Academy of Architecture, 1935 (in Russian). ISIS

Reviewed by A. POGO, *Isis*, 26, 158, 1936.

Ivins, William M., jr. The Albertian scheme. *Bulletin of the Metropolitan Museum of Art* 31, 278-80, 1 facs., 1936. ISIS

Apropos of L. B. ALBERTI's views on perspective. G. S.

Thorndike, Lynn. Epitomes of PLINY's Natural history in the fifteenth century. *Isis* 26, 39, 1936. ISIS

Wardale, W. L. ALBRECHT VAN BORGUNNIEN's Treatise on medicine (Sloane ms. 3002, British Museum). xlvii + 80 p. (St. Andrews University publication, 38). Oxford University Press, 1936 (10/6). ISIS

Edition of a low German medical text. "The dialect is throughout Eastern North Low Saxon, typical of the Baltic Colonial Area c. 1425-1450; possibly the text originated in Rostock or Lübeck. The scribe was not a Scandinavian." (The text may be earlier, fourteenth century?). The author, called Meyster ALBRECHT (ALBERTUS) VAN BORGUNNIEN in Vlaanderen Lande, cannot be located either in time or space. The text was probably a source of the Düdesche Arstedie represented by four large MSS, or both texts were derived from a common source. The text includes: (1) Register and prologue. (2) MACER, 129 items in three books. The MACER lacks its own prologue (as in the Wolffenbüttler Arzneibuch) present in most of the HG versions from one of which it derives. (3) Recipes. The edition has been prepared with considerable care and is completed with a glossary. However it is regrettable that the author did not formulate his conclusions with greater clearness. He has done only a part of his work; let us hope that the work will soon be completed, and the text becomes then really available to the historian of medicine. G. S.

XVth century (second half)

Duff, Charles. The truth about COLUMBUS and the discovery of America. 330 p. London, GRAYSON and GRAYSON, 1936. ISIS

Reviewed by H. P. BIGGAR, *Geographical journal* 88, 279-81, 1936.

Fontoura da Costa, A. As portas da India em 1484. 124 p. Lisboa, Imprensa da Armada, 1935. ISIS

Reviewed by E. HEAWOOD, *Geographical journal* 88, 378-9, 1936. "At the historical congress at Warsaw in 1933, Professor E. DEPREZ called attention to a passage in a booklet printed at Rome, it seems, in 1485, which in his view made it probable that the Cape had already been passed at that date. The author of the present brochure, after carefully examining each of the recorded voyages in the light of all available records, finds that Prof. DEPREZ's conclusion is not necessary. The first voyage of Cão in 1482-4 ended at a point where the coast was seen trending east, and might well have encouraged the belief that the gate of the Indian Ocean had been reached." C. W. A.

Germani, Giuseppe M. Un'inglese, educato in Italia, fondatore del "Royal College of physicians" di Londra. *Rivista di storia delle scienze mediche* 27, 429-30, 1936. ISIS

Apropos of THOMAS LINACRE (1460?-1524). G. S.

Kibre, Pearl. The library of PICO DELLA MIRANDOLA. xiv + 330 p. New York, Columbia University Press, 1936. ISIS

Reviewed by M. F. ASHLEY-MONTAGU, *Isis* 26, 159-61, 1936.

Zinner, Ernest. REGIOMONTANUS in Ungarn. *Mathematischer und Naturwissenschaftlicher Anzeiger der Ungarischen Akademie der Wissenschaften* 55, 280-87, 1936 (in Hungarian with German summary). ISIS

Zinner, Ernst. Zum 500. Geburtstage REGIOMONTANS. *Forschungen und Fortschritte* 12, 210-12, illus., 1936. ISIS

XVIth century (whole and first half)

B. — *Physical sciences and technology*

Gunther, R. T. The newly found astrolabe of Queen ELIZABETH: a sixteenth century navigational instrument, one of the finest of its kind, discovered at Oxford: the only extant work by THOMAS GEMINI. *Illustrated London News*, Oct. 24, pp. 738-39, 6 fig., 1936. ISIS

Lippmann, Edmund O. von. BIRINGUCCIO und AGRICOLA. *Isis* 26, 37-8, 1936. ISIS

McColley, Grant. NICOLAS COPERNICUS and an infinite universe. *Popular astronomy* 44, 9 p., 1936. ISIS

Partington, J. R. BIRINGUCCIO and AGRICOLA. *Isis* 26, 37-8, 1936. ISIS

C. — *Natural sciences*

Oppenheimer, Jane M. GUILLAUME RONDELET. *Bull. of the institute of the history of medicine* 4, 817-34, 1936. ISIS

D. — *Medical sciences*

Holcomb, Richmond C. RUIZ DE ISLA defines his serpentine disease of the Island of Española. *Medical life* 43, 415-70, 1936. ISIS

Holcomb, Richmond C. RUIZ DIAZ DE ISLA and the Haitian myth of the European origin of syphilis. *Medical life* 43, 487-514, 1936. ISIS

James, R. R. THOMAS HUYS, M. D., physician to MARY TUDOR. *Janus* 40, 171-77, 1936 ISIS

Moulé, Léon. Glossaire vétérinaire du XVI^e^ siècle. *Janus* 40, 49-64, 85-98, 218-32, 1936. ISIS

Vannier, Léon. L'œuvre de PARACELSE. *Bull. de la société franç. d'hist. de la médecine* 32, 145-60, 213-24, 1936 (to be continued). ISIS

XVIth century (second half)

B. — *Physical sciences and technology*

Bernard, Henri (S. J.). MATTEO RICCI's scientific contribution to China. Translated by EDWARD CHALMERS WERNER. 108 p., 6 pl. Peiping, VETCH, 1935. ISIS

Reviewed by GEORGE SARTON, *Isis* 26, 164-67, 2 fig., 1936.

Luth, Oluf (d. 1580). Nogre stycker af thenn frije konst astronomia (Cod. Holm. D 77) med innledning utgiven av HENRIK SANDBLAD. xxiv + 91 p. (Skrifter utgivna av K. Humanistiska Vetenskaps-Samfundet i Uppsala, 29 : 4), Uppsala, ALMQVIST & WIKSELLS, 1935. ISIS

Reviewed by WILLY HARTNER, *Isis* 26, 161-64, 1936.

McColley, Grant. FRANCESCO GIUNTINI and the Copernican hypothesis. *Popular astronomy* 45, 70-3, facs., 1937. ISIS

Apropos of *La sfera del mundo* (Lyons 1582), by FRANCESCO GIUNTINI (1522-1590).

C. — *Natural sciences*

Hakluyt, Richard. The original writings and correspondence of the two RICHARD HAKLUYTS. Edited by E. G. R. TAYLOR. Vol. I, xiv + 210 p., vol. 2, x + 211-516 p. London, Hakluyt Society, 1935. ISIS

Reviewed by J. N. L. BAKER, *Geographical journal* 88, 379-80, 1936. 137 documents and extracts from the miscellaneous writings of RICHARD HAKLUYT the elder, barrister of Middle Temple, and RICHARD HAKLUYT the younger, archdeacon. C. W. A.

Trimborn, H. Fuentes de la historia cultural de la América precolombina. 262 p. (Studien zur Kulturkunde, 3). Stuttgart, STRECKER und SCHRÖDER, 1936. ISIS

Reviewed by F. M. M., *Geographical journal* 88, 469-70, 1936. Three documents. The first, geographical and ethnographical notes on Peru, compiled in 1597 for the viceroy by his chaplain. The second, " La guerra de los Chichimecas," written between 1571 and 1585, an apologia for the war waged against the primitive tribes of hunters, probably written by GONZALO DE LAS CASAS. The third, an official report, dated 1558, of two ecclesiastics on the system of government which obtained in the valley of Chincha before the Incas and under their rule. C. W. A.

XVIIth century (whole and first half)

B. — *Physical sciences and technology*

Calvert, H. R. THOMPSON of Hosier Lane, instrument makers of the seventeenth century. *Isis* 26, 50-2, 1936. ISIS

" The firm of THOMPSON (or TOMSON) in Hosier Lane appears to have been well known in the seventeenth century. In books published about 1610 there are advertisements for JOHN TOMSON; and frequent references to ANTHONY THOMPSON, of Hosier Lane, occur in books published about 1650 or 1660. CLAY and COURT in ' The history of the microscope ' (C. GRIFFIN, London 1932) refer in a list of instrument makers to ' THOMPSON, for TOMSON) ANTHONY, of Hozier Lane, Smithfield ' and also to ' THOMPSON, Junior. Same address,' which implies that the firm was continued after the time of ANTHONY. Many of the advertisements mention specifically that TOMSON makes his scales in wood, which accounts for the fact that little of his work appears to have survived. There are no examples in the Science Museum."

Chalmers, Gordon Keith. The lodestone and the understanding of matter in seventeenth century England. *Philosophy of science* 4, 75-95, 1937. ISIS

Cooper, Lane. GALILEO and scientific history. *Scientific monthly* 43, 163-67, 1936. ISIS

Ockenden, R. E. MARCO ANTONIO DE DOMINIS and his explanation of the rainbow. *Isis* 26, 40-9, 1936. ISIS

"1. DE DOMINIS did not give the correct elementary theory of the rainbow; his explanation of the primary bow is incomplete, while that of the secondary bow is quite erroneous. DESCARTES, who gave the correct explanation in 1637, could not have been indebted on any essential point to DE DOMINIS. 2. NEWTON's statements in the *Opticks* concerning DE DOMINIS are incorrect; they were probably inserted in order to depreciate the importance of DESCARTES' work."

C. — *Natural sciences*

Meyer, Arthur William. An analysis of the *De generatione animalium* of WILLIAM HARVEY. xx + 167 p., 11 ills. Stanford University Press, California, 1936. ISIS

Reviewed by C. D. LEAKE, *Isis* 26, 174-76, 1936.

E. — *Alia*

Jones, Richard Foster. Ancients and moderns: a study of the background of the Battle of the Books. xi + 358 p. St. Louis, Washington University Studies, new series, Language and literature, no. 6. ISIS

Reviewed by ROBERT K. MERTON, *Isis* 26, 171-72, 1936.

Nordström, Johan. GEORG STIERNHIELM, Filosofiska fragment med inledning och kommentar. Vol. I, 27 + ccclxi p.; vol. 2, 294 p. Stockholm, BONNIER, 1924. ISIS

Reviewed by O. LARSELL, *Isis* 26, 172-74, 1936.

Pogo, Alexander. KIRCHER, not NARDI (*Isis* 24, 430-1). Answer to query no. 56. *Isis* 26, 150-51, 1936. ISIS

"KIRCHER, not NARDI, deserves full credit for recognizing fragments of clepsydrae in the items represented in Figs. I and II of NARDI's Tab. VIII (see facsimile in *Isis* 24, 431, 1936)." However "NARDI is entitled to a place in the history of Egyptology; this claim rests on the following sections of his edition of LUCRETIUS."

XVIIth century (second half)

A. — *Mathematics*

Hjelmslev, Johannes. Beiträge zur Lebensbeschreibung von GEORG MOHR (1640-1697). 22 p., 1 pl. (Det Kgl. Danske Videnskabernes Selskab, Mathematisk-fysiske Meddelelser, 11, 4). København, HØST, 1931. ISIS

Reviewed by GEORGE SARTON, *Isis* 26, 167-70, 1 facs., 1936.

Mohr, Georg. Euclides danicus, Amsterdam 1672. Med et forord af JOHANNES HJELMSLEV. Udgivet af det Kgl. Danske Videnskabernes Selskab. viii + 36 p., pls. København, HØST, 1928. ISIS

Reviewed by GEORGE SARTON, *Isis* 26, 167-70, 1 facs., 1936.

Newton, Isaac. Naturvetenskapens matematiska principer, Svensk översättning av C. V. L. CHARLIER. Part I, xxx + 291 p.; part II, xii + 194 p.; part III, vii + 158 p. Lund, GLEERUP, 1927-31. ISIS

Reviewed by WILLY HARTNER, *Isis* 26, 176-77, 1936.

Shain, Julius. The method of cascades. *American mathematical monthly* 44, 24-29, 1937. ISIS

"MICHEL ROLLE is generally recognized as the inventor of what mathematicians call ROLLE's Theorem. His outstanding contribution to mathematics is his Method of Cascades, a process for the general solution of numerical equations of the form $x^n + a_1x^{n-1} + a_2x^{n-2} + \ldots a_n = 0$. ROLLE gave its steps in his *Traité d'algèbre* in 1690. In 1691 at the suggestion of mathematicians he published a proof of the method in his *Demonstration*."

C. — *Natural sciences*

Cole, F. J. LEEUWENHOEK's zoological researches—part 1. *Annals of science* 2, 1-46, 1937. ISIS

Cole, F. J. JAN SWAMMERDAM, 1637-80. *Nature* 139, 218-20 1937. ISIS

XVIIIth century (whole and first half)

A. — *Mathematics*

Auchter, Heinrich. BROOK TAYLOR der Mathematiker und Philosoph. Beiträge zur Wissenschaftsgeschichte der Zeit des NEWTON-LEIBNIZ-Streites. 112 p., frontispiece, Würzburg, TRILTSCH, 1937. ISIS

This thesis done under the supervision of Prof. DIETRICH MAHNKE is a very welcome addition to the history of mathematics. Every mathematician knows of BROOK TAYLOR, because of "TAYLOR's theorem" (1715) but he knows very little else about him. AUCHTER's study is divided as follows: "1. TAYLORS Leben und Schriften. 2. Die mathematischen Leistungen T's und ihr Verhältnis zu den Entdeckungen von LEIBNIZ und JOHANN BERNOULLI. 1. Gesamtbericht über die 'Methodus incrementorum'; 2. Geschichte des Streites um T's Selbständigkeit (1716-22); Prüfung der Prioritätsansprüche JOH. BERNOULLIS, besonders hinsichtlich der 'Bernoullischen Reihe'; 4. Prüfung der Prioritätsansprüche LEIBNIZENS, besonders hinsichtlich der 'Taylorschen Reihe.' 3. Die philosophischen Anschauungen T's. Anhang A: Aus T's wissenschaftlichen Briefwechsel, *a*) Fundorte sämtlicher bisher gedruckten wiss. Briefe, *b*) Inhaltsangabe der 1793 veröffentlichten wiss. Briefe, *c*) Text der 1793 veröffentlichten wiss. Briefe, Anhang B: Text der 'Contemplatio philosophica'; Literaturverzeichnis

G. S.

Masé-Dari, Eugenio. Un precursore della econometria. Il saggio di GIOVANNI CEVA "De re numaria" edito in Mantova nel 1711. 59 p. (*Pubblicazioni della facolta di giurisprudenza della R. Università di Modena*, 62). Modena, 1935. ISIS

GIOVANNI CEVA born in the province of Milano in 1647-48, died during the siege of Mantova, 1734. He was professor of mathematics and hydraulics. He published in Mantova 1711 a treatise on money "De re numaria quoad fieri potuit geometrice tractata," which is claimed to be the foundation of econometry. It is an exceedingly rare booklet of 60 pp. (20 × 15 cm.). It is here reproduced verbatim (pp. 37-59) with an elaborate introduction. Thus this is the second edition of CEVA's treatise; English translation of it seems very desirable.

G. S.

B. — *Physical sciences and technology*

Corrigan, J. Frederick. STEPHEN GRAY (1696-1736). An early electrical experimenter. *Science progress* 19, 102-14, 1924. ISIS

Nordenmark, N. V. E. ANDERS CELSIUS, professor i Uppsala, 1701-1744. 284 p., figs. (Lychnos-Bibliothek, Studier och källskrifter utgivna av Lärdomshistoriska Samfundet, *Studies and sources published*

by the Swedish history of science society, 1). Uppsala, ALMQVIST & WIKSELLS, 1936. ISIS

Reviewed by GEORGE SARTON, *Isis* 26, 177-80, 1936.

C. — *Natural sciences*

Neviani, Antonio. Un ingiusto giudizio di ANTONIO VALLISNERI su L. F. MARSILI. L'animo umanitario e religioso del MARSILI. Appendice sul cranio del Conte MARSILI nella certosa di Bologna. *Rivista di storia delle scienze mediche* 27, 349-70, 1936. ISIS

Woodruff, Lorande Loss. LOUIS JOBLOT and the protozoa. *Sci. Month.* 44, 41-47, 1937. ISIS

Important note on JOBLOT's (1645-1723) microscopic study of protozoa, *Descriptions et usages de plusieurs nouveaux microscopes*, Paris 1718. He began his work in 1680 to verify LEEUWENHOECK's reports. JOBLOT first noted the contractile vacuole in infusoria, and first pictured Paramecium. " JOBLOT apparently was the first to demonstrate not only that organisms do not appear in an infusion that has been boiled and sealed from atmospheric contamination, but also that such boiled infusions, though devoid of life, again readily support life when it is admitted from the air." C. D. L.

D. — *Medical sciences*

Cushing, Harvey. ERCOLE LELLI and his Écorché. *Yale Jour. Biol. and med.* 9, 199-213, Jan., 1937. ISIS

In CUSHING's always delightful style with splendid illustrations, this is a general essay on representations of the flayed human body in art. It refers particularly to the ecorches in the Teatro Anatomico in the Archiginnasio of Bologna, carved by ERCOLE LELLI (1703-1766) in 1733. There is an admirable description of the other decorations of the Teatro Anatomico. Also of other flayed figures in art. The legend of SAN BARTOLOMEO is the theme for several of these, such as the portion of MICHELANGELO's " Last judgment " (1541) in the Sistine Chapel. C. D. L.

Izquierdo, J. J. The first book on physiology written and printed in the New World. *Bulletin of the institute of the history of medicine* 5, 73-90, 5 p. of facsimile, 1937. ISIS

Apropos of " a book printed in Mexico City in 1727 by Doctor MARCOS JOSÉ SALGADO."

Lannois, M. A propos d'un tableau du Musée de Gadagne relatif

à la peste de 1720. *Bull. de la soc. française d'hist. de la médecine* 30, 377-78, 1936. ISIS

Tournier-Lasserve, M. Contribution à l'histoire des salles de dissections au XVIII[e] siècle : THÉOPHILE DE BORDEU, démonstrateur d'anatomie à Pau, en 1750. *Bull. de la soc. franç. d'histoire de la médecine* 30, 363-72, 1936. ISIS

XVIIIth century (second half)

B. — *Physical sciences and technology*

Fulton, John F.; Cushing, Harvey. A bibliographical study of the GALVANI and the ALDINI writings on animal electricity. *Annals of science* 1, 239-68, 9 pl., 1936. ISIS

The splendid bibliographical service being rendered by Dr. FULTON and Dr. CUSHING, which is so important for the history of science, continues at a remarkably rapid pace. The present work is a delightful bio-bibliographical study of LUIGI GALVANI (1737-1798), his wife, the talented LUCIA GALEAZZI, and his nephew, GIOVANNI ALDINI (1762-1834). This important paper contains characteristically careful bibliographical descriptions of GALVANI's *De viribus electricitatis*, Bologna, 1791, its subsequent editions, translations and related volumes. The modesty of GALVANI is well contrasted with the publicity-seeking of ALDINI. C. D. L.

McKie, Douglas. ANTOINE LAVOISIER. The father of modern chemistry. 303 p., 5 fig., 2 port. Philadelphia, LIPPINCOTT, 1935. ISIS

Reviewed by MARY ELVIRA WEEKS, *Isis* 26, 180-83, 1936.

Ôtani, Ryôkichi. TADATAKA INÔ, the Japanese land surveyor. Published by the Imperial Academy of Japan. xxxv + 766 p., quarto, Tokyo, 1917 (in Japanese). English abbreviated translation by KAZUE SUGIMURA. With a preface by H. NAGAOKA. v + iv + 358 p., octavo, 47 ill. (The Yamato Society of Japan). Tokyo, IWANAMI, 1932. ISIS

Reviewed by GEORGE SARTON, *Isis* 26, 196-200, 1936.

Thomas, A. L. The Duke of Bridgewater and the canal era. *Geography* 21, 297-300, 1936. ISIS

The Bridgewater Canal constructed 1759-67, JAMES BRINDLEY being the engineer, was followed by a succession of great canal schemes to connect industrial centres with ports in England. C. W. A.

Walker, W. Cameron. Animal electricity before GALVANI. *Annals of science* 2, 84-113, 4 pl., 1937. ISIS

C. — *Natural sciences*

Merrill, E. D. PALISOT DE BEAUVOIS as an overlooked American botanist. *Proceedings of the American philosophical society* 76, 899-920, port., 1936. ISIS

Morrison, James. The journal of JAMES MORRISON, boatswain's mate of The Bounty, describing the mutiny and subsequent misfortunes of the mutineers, together with an account of the Island of Tahiti. Edited by OWEN RUTTER. 242 p. London, Golden Cockerel Press, 1935. ISIS

Reviewed by J. N. L. BAKER, *Geographical journal* 88, 380, 1936. "MORRISON was an observant man, so his long and detailed account of Tahiti, which occupies half this volume, is of permanent value."
C. W. A.

True, Rodney H. THOMAS JEFFERSON's garden book. *Proceedings of the American philosophical society* 76, 939-45, 1936. ISIS

D. — *Medical sciences*

Beebe, Lewis (1749-1816). Wartime journal of a surgeon in the Revolutionary army. *Annals of medical history* 9, 88, 1937. ISIS

Apropos of Dr. LEWIS BEEBE. G. S.

Cook, S. F. The Monterey surgeons during the Spanish period in California. *Bull. of the institute of the history of medicine* 5, 43-72, 1937. ISIS

Keil, Harry. Dr. WILLIAM CHARLES WELLS (1757-1817), and his contribution to the study of rheumatic fever. *Bull. of the institute of the history of medicine* 4, 789-816, 1936. ISIS

Meyer, A. W. The HUNTERS in embryology. *Calif. and West. med.* 45, 420-22, 492-95, 1936; 46, 38-40, 1937. ISIS

Important critical analysis of the contributions of WILLIAM (1718-1783) and JOHN HUNTER (1728-1793) to embryology. WILLIAM's great work, *Anatomia uteri humani gravida tabulis illustrata*, appeared in 1774 in Birmingham. C. D. L.

Quynn, William. The letters of a Maryland medical student in Philadelphia and Edinburgh (1782-1784). *Annals of medical history* 9, 89, 1937. ISIS

Apropos of WILLIAM QUYNN. G. S.

Roddis, Louis H. WILLIAM WITHERING. The introduction of digitalis into medical practice. xi + 131 p., 8 ills. New York, HOEBER, 1936. ISIS

Attractive reprint of article originally appearing in the *Annals of medical history* (n.s. vol. 8, no. 2 and 3, March and May, 1936). Good discussion of WITHERING's life (1741-1799) and his relations with his contemporaries, and a good appraisal of the significance of his *An account of the foxglove, and some of its medical uses*, Birmingham, 1785. This is a short bibliographical note but unfortunately no index. C. D. L.

Siebold, Karl. CARL CASPAR VON SIEBOLD zum Gedächtnis. Zu seinem 200. Geburtstag am 4. November 1936. *Janus* 40, 145-47, 1936. ISIS

Terson, Albert. PELLIER DE QUENGSY. 28 p., illus. Paris, STEINHEIL, 1895. ISIS

La chirurgie oculaire française du XVIII[e] siècle a brillé d'un vif éclat. Dans deux ouvrages presque introuvables : *Recueil de mémoires et d'observation*, Montpellier 1783 et *Cours d'opérations sur les yeux*, Paris et Montpellier 1787, PELLIER a donné le meilleur tableau d'ensemble de l'oculistique de la seconde moitié de XVIII[e] siècle. L'auteur a réuni les documents contenus dans ces publications en insistant surtout sur la chirurgie oculaire.
L. L.

XIXth century (whole and first half)

B. — *Physical sciences and technology*

Brandner, G. de ; Lagrange, E. Les méridiennes de QUETELET. *Ciel et terre* 52, 175-76, 1936. ISIS

Chevreul, Michel Eugène (1786-1889). Candid photographs of CHEVREUL. *Life* 2, pp. 2, 3, and 6, January 11, 1937. (Chicago, *Time*). ISIS

Seven unposed photographs of CHEVREUL, taken by NADAR of Paris while CHEVREUL was not aware of the camera. " PAUL NADAR's father was FELIX NADAR (1820-1910) who photographed VICTOR HUGO, GEORGE SAND, LOUIS PASTEUR, SARAH BERNHARDT, FRANZ LISZT, and many another 19th century

celebrity. PAUL was anxious to get away from the formal portraits his father took. In 1886, he schemed with his father to take informal pictures of MICHEL EUGENE CHEVREUL, great French chemist who was 100 years old that year. CHEVREUL, with bamboo stick and embroidered slippers, was lured to the studio and was there so skillfully engaged in conversation that he forgot about the bright lights and about PAUL NADAR standing over his box camera, shuffling his plates as fast as he could... The results delighted PAUL NADAR but he never took any more candid camera pictures... He forgot completely about these historic pictures until they were unearthed last October in the course of a squabble between NADAR, who at 80 still runs his studio in Paris, and the French National Archives over ownership of the plates." One picture shows CHEVREUL signing the NADAR register, the others show him in animated conversation with the elder NADAR and are accompanied by legends which presumably reproduce his remarks, as follows—" Les sentiments moraux de l'honnête homme excepté, je suis prêt à abandonner tout ce que je fais, si on me démontre par expérience que je me suis trompé ! ! ! " " On a peu de disposition à prêter l'oreille aux amateurs, sachant combien leur genre d'esprit prête aux illusions et surtout combien leur conversation est ennuyeuse." " Moi, le fils d'un orang-outan ? Jamais ! ! ! " " Je ne vous ai pas tout dit ! Mais dire n'est rien, il faut prouver, faire voir. Je vous ferai voir, il faut que vous voyez, parce que c'est quand je vois que je crois." " Je n'aime pas m'occuper de plusieurs choses à la fois ! ! ! " " ARAGO avait dans son rapport sur l'héliographie omis de mentionner le nom de NIÈPCE, le véritable inventeur." T. L. D.

Hendrick, James. McCORMICK and the reaping machine. *Nature* 139, 197, 1937. ISIS

" The first really practical machine which was able to cut a harvest and continue to do so year after year was made by the Rev. PATRICK BELL, in 1828, when he was a divinity student at the University of St. Andrews. A full account of this machine was published in 1828 in the *Quarterly Journal of Agriculture*. The original machine, which BELL made with his own hands with the assistance of the local blacksmith, is now in the Science Museum at South Kensington. This machine was used on the farm of BELL's father and afterwards on the farm of his brother for many years. The earliest year in which it is claimed that McCORMICK produced a reaper is 1831, but no proof can be produced to show that he made any machines until several years later. By that time several of BELL's machines had found their way to America."

Lippmann, Edmund O. v. Die Werksvorrichtungen bei Beginn der Rübenzuckerfabrikation. *Chemische Apparatur* 24, 1 p., 1937.

Lippmann, Edmund O. von. Vor hundert Jahren (XVI). *Die Deutsche Zuckerindustrie*, p. 48 ff., 1937. ISIS

Withington, Sidney. The first twenty years of railroads in Con-

necticut. 32 p. (Tercentenary commission of the state of Connecticut, 45). New Haven, Yale University Press, 1935. ISIS

C. — *Natural sciences*

Castiglioni, Arturo. GEROLAMO SEGATO (1792-1836). Commemorazione tenuta nel teatro di Belluno il 13 giugno 1936-XIV. *Rivista di storia delle scienze mediche* 27, 273-85, 1936. ISIS

Eyles, V. A. JOHN MACCULLOCH, F. R. S., and his geological map: an account of the first geological survey of Scotland. *Annals of science* 4, 114-29, 4 pl., 1937. ISIS

Meyer, A. W. Was VON BAER's discovery an accident? *Bull. of the Institute of the history of medicine* 5, 33-42, 1937. ISIS

D. — *Medical sciences*

Behneman, Harold M. F. Quackery and naturopathic logic in 1795-1825. *Calif. and West. med.* 44, 104-07, 1936. ISIS

Refers to SAMUEL THOMSON (1769-1843) and his *New Guide to health; or, Botanic family physician*, Columbus, Mass., 1822. C. D. L.

Cook, Sherburne F. California's first medical survey; report of surgeon-general JOSÉ BENITES, 1805. *Calif. and West. med.* 45, 352-54, 1936. ISIS

First complete translation, with added translation of statement by the Royal medical board of Mexico City. The chief diseases reported were tuberculosis, syphilis, dysentery, and inflammatory fevers. These were found chiefly among the Indians at the Missions, and sometimes among the whites. "The causes of these diseases are: impure relations on a great scale, the great filthiness of their bodies and villages, ... the depraved use of a sweathouse(temescal)." Infirmaries were recommended. The statement of the Royal medical board refers to smallpox epidemics, but doubts that anything "can be devised which can spare the inhabitants the diseases which they suffer." C. D. L.

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XXth century

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6. — MIDDLE AGES (*generalities*)

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adequate proofs of his own conclusions are entirely lacking, and there are no foot-notes nor any bibliography. The second and third articles, " The religious crisis in the twelfth and thirteenth centuries " and " The later middle ages," both written by JEAN GUIRAUD, are interesting and valuable summaries of important problems in the later middle ages. The author has included footnotes and a brief bibliography. The fourth article, " Ancient and medieval philosophy " by A. E. TAYLOR is a very brief survey of the history of philosophy from the pre-Socratic cosmologists through the period of WILLIAM of OCCAM. There is a list of authorities at the end.
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21. — STATISTICS

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III. — PHYSICAL SCIENCES (knowledge of inorganic nature)

22. — MECHANICS (*Including celestial and atomical mechanics*)

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23. — ASTRONOMY

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25. — CHEMISTRY, PHYSICO-CHEMISTRY, INDUSTRIAL CHEMISTRY

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Färber, Eduard. Alte Gedanken und neue chemische Theorien. *Isis* 26, 99-126, 1937. ISIS

1. Chemische Ausbildung allgemeiner Gedanken; 2. Das Erhaltungsgesetz; 3. Kausal-Gesetz; 4. Der Stetigkeitsgedanke; 5. Elemente und Stoffe; 6. Theorie der Verbrennung; 7. Wasserstoff und Sauerstoff; 8. Grenzen; 9. Chemische Theorien und philosophische Systeme; JOHN LOCKE, GOTTFRIED WILHELM LEIBNIZ, DAVID HUME, IMMANUEL KANT, JAKOB FRIEDRICH FRIES, GEORG WILHELM FRIEDRICH HEGEL, ARTHUR SCHOPENHAUER; 10. Chemische Analogien in der philosophischen Psychologie des 19. Jahrhunderts, Zusammenfassung.

(Ruska, Julius). JULIUS RUSKA und die Geschichte der Alchemie mit einem vollständigen Verzeichnis seiner Schriften. Festgabe zu seinem 70. Geburtstage am 9. Februar 1937. Dargeboten von der Deutschen Gesellschaft für Geschichte der Medizin, Naturwissenschaft und Technik. 40 p. *Abhandlungen zur Geschichte der Medizin und der Naturwissenschaften* 19, Berlin, 1937. ISIS

See note WINDERLICH. Our sincere congratulations to Professor RUSKA and our best wishes for his birthday and many happy returns of it.
G. S.

Winderlich, R. Verschüttete und wieder aufgegrabene Quellen der Alchemie des Abendlandes. *Abhandlungen zur Geschichte der Medizin und der Naturwissenschaften* 19, 40 p., Berlin 1937. ISIS

Account of RUSKA's studies in Arabic alchemy, followed with a bibliography of RUSKA's writings 1895 to 1937. G. S

IV. — BIOLOGICAL SCIENCES (knowledge of organic nature)

27. — BIOLOGY (*generalities, " natural history "*)

Haldane, John Scott (1860-1936). The philosophy of a biologist. xii + 155 p. Oxford University Press, 1935. ISIS

Reviewed by H. T. DAVIS, *Isis* 26, 220-23, 1936.

Harris, Leslie J. Vitamins in theory and practice. xix + 240 p. Cambridge, University Press, 1935. ISIS

Reviewed by M. F. ASHLEY-MONTAGU, *Isis* 26, 228-29, 1936.

28. — BOTANY

(*Agronomy, Phytopathology, Palaeobotany*)

Anderson, Russell H. Grain drills through thirty-nine centuries. *Agricultural history* 10, 157-205, 12 fig., 1936. ISIS

Darmstaedter, Ernst. Die Ginseng-Wurzel. *Pharma-Medico* 4, 6 p. (n. d.). ISIS

Fussell, G. E. Soil classification in the 17th and 18th centuries. *Pedology* 409-19, Moscow, 1933. ISIS

Jacquot, Raymond ; Nataf, Berthe. Le manioc et son utilisation alimentaire. Introduction de EMILE F. TERROINE. 56 p. (*Actualités scientifiques et industrielles*, 364, Nutrition, 1). Paris, HERMANN, 1936. ISIS

Monteiro, Arlindo Camilo. Da fitologia sacra. Contribução histórica para o estudo da botânica, da terapêutica e da etnografia. 140 p., pl. Edição do autor (no place, presumably Lisboa), 1934. ISIS

Reviewed by PAUL M. O'SULLIVAN, *Isis* 26, 223-24, 1936.

29. — ZOOLOGY

Dantchakoff, Vera. Histoire d'un coq. Sa cinétique sexuelle. Avec la collaboration de A. VASHKEVITSCHUITE, JANKOVSKY MASSIAVITCHUS et KINDERIS. 41 p., 12 fig. (*Actualités scientifiques et industrielles*, 370). Paris, HERMANN, 1936. ISIS

Sunamoto, Etsujiro. Zô. Elephants. 2416 p., 431 pl., ills. With a separately bound " Résumé of the Elephants " in English. 16 p. Osaka, SANYUSHA, 1931-32 (in Japanese). ISIS

Reviewed by SHIO SAKANISHI, *Isis* 26, 191, 1936.

Verlaine, Louis. Histoire naturelle de la connaissance chez le singe inférieur. II. Le syncrétique ; III. L'abstrait· 58 p., 8 fig. ; 54 p., 8 fig. (*Actualités scientifiques et industrielles*, 320, 360). Paris, HERMANN, 1936. ISIS

V. — SCIENCES OF THE EARTH

(implying knowledge of both organic and inorganic nature)

30. — GEODESY

Schmidt, Fritz. Geschichte der geodätischen Instrumente und Verfahren im Altertum und Mittelalter. 400 p., 26 pl. (Veröffentlichungen der Pfälzischen Gesellschaft zur Förderung der Wissenschaften, 24). Neustadt an der Haardt, Pfälzische Gesellschaft zur Förderung der Wissenschaften, 1935. ISIS

Reviewed by WILLY HARTNER, *Isis* 26, 224-28, 1936.

31. — GEOGRAPHY AND OCEANOGRAPHY

Joerg, W. L. G. The geography of North America : a history of its regional exposition. *Geographical review* 26, 640-63, 1936. ISIS

North, F. J. The map of Wales before 1600 A. D. 69 p. Cardiff, National Museum of Wales, 1935. ISIS

Reviewed by W. E. WHITEHOUSE, *Geography* 21, 309, 1936. Cartographical history. C. W. A.

VI. — ANTHROPOLOGICAL AND HISTORICAL SCIENCES

(knowledge of man, past and present)

34. — ANATOMY

Miller, William Snow. The lung. xiv + 209 p., 152 ills. Springfield, Ill., THOMAS, 1937. ISIS

This magnificent monograph on the anatomical structure of the lung represents the author's forty-seven years of study on the subject, mostly at the University of Wisconsin. The book is very succinctly written and

is illustrated by a host of remarkably clear and original pictures, many of them colored. Dr. MILLER's sound historical sense has led him to devote a special chapter to the historical development of our knowledge of lung structure, with detailed references to the leading contributors to this knowledge. Among them were M. MALPIGHI (1628-1694), T. WILLIS (1622-1675), F. D. REISSEISEN (1778-1828), H. ROSSIGNOL (1815-1870), R. A. KÖLLIKER (1817-1905), A. T. H. WATERS (1826-1912), and G. E. RINDFLEISCH (1836-1908). The whole book is developed in a historical manner and this adds greatly to its clarity and ease of understanding. There is no doubt but that it will be the classic work on the structure of the lung. There is a good bibliography and index. C. D. L.

35. — PHYSICAL ANTHROPOLOGY

(Anthropometry and races of man)

Cobb, W. Montague. The laboratory of anatomy and physical anthropology of Howard University. x + 107 p., 13 pl. Washington, D. C., 1936. ISIS

Reviewed by RAYMOND PEARL, *Journal of Negro history* 447-49, October 1936.

Penniman, T. K. A hundred years of anthropology. 400 p. New York, MACMILLAN, 1936. ISIS

Reviewed by M. F. ASHLEY-MONTAGU, *Isis* 26, 229-32, 1936.

37. — PSYCHOLOGY *(human and comparative)*

Piéron, Henri. La connaissance sensorielle et les problèmes de la vision. 91 p. (*Actualités scientifiques et industrielles*, 377). Paris, HERMANN, 1936. ISIS

39. — PREHISTORY

Eyre, Edward. European civilization. Its origin and development. By various contributors. Vol. I : Prehistoric man and earliest known societies. vi + 844 p., 19 maps. New York, Oxford University Press, 1935. ISIS

Reviewed by M. F. ASHLEY-MONTAGU, *Isis* 26, 232-34, 1936.

Nelson, N. C. Prehistoric archeology, past, present and future. *Science* 85, 81-89, 1937. ISIS

Address of the vice-president and chairman of the section on anthropology, American Association for the Advancement of Science, Atlantic City December 1936.

40. — ETHNOLOGY (*Primitive and popular science*)

Castetter, Edward F.; Opler, M. E. The ethnobiology of the Chiricahua and Mescalero Apache. A. The use of plants for foods, beverages and narcotics. 63 p. (*University of New Mexico bulletin, ethnobiological studies in the American southwest*, 3). November 15, 1936. ISIS

Diamond, A. S. Primitive law. x + 451 p. London, LONGMANS GREEN, 1935. ISIS

Reviewed by M. F. ASHLEY-MONTAGU, *Isis* 26, 234-37, 1936.

43. — SOCIOLOGY, JURISPRUDENCE AND POSITIVE POLITY

Horder, Lord. The strain of modern civilization. *Nature* 138, 529-31, 1936. ISIS

From the introduction to a discussion in section I (physiology) of the British Association at Blackpool on September 15.

De Kruif, Paul; de Kruif, Rhea. Why keep them alive? vii + 293 p. London, CAPE, 1936. ISIS

Reviewed by CLIFFORD DOBELL, *Nature* 138, 523-25, 1936.

Merton, Robert K. The unanticipated consequences of purposive social action. *American sociological review* 1, 894-904, 1936. ISIS

49. — HISTORY OF RELIGION (*Science and religion*)

Griffiths, Olive M. Religion and learning. A study in English Presbyterian thought from 1662 to the foundation of the Unitarian movement. 202 + viii p. Cambridge University Press, 1935. ISIS

Reviewed by ROBERT K. MERTON, *Isis* 26, 237-39, 1936.

Karsten, Rafael. The origins of religion. vii + 328 p. London, KEGAN PAUL, 1935. ISIS

Reviewed by M. F. ASHLEY-MONTAGU, *Isis* 26, 239-43, 1936.

VII. — MEDICINE

50. — HISTORY, ORGANIZATION AND PHILOSOPHY OF MEDICINE

Army medical library number. Centenary celebration. *Medical life* 43, 533-604, 1 facs., 1 port., 1936. ISIS

Contents : Col. HAROLD W. JONES : The centenary of the Army medical library; Sir HUMPHRY ROLLESTON : The oration commemorating the one hundredth anniversary of the founding of the Army medical library, Washington; Col. HAROLD WELLINGTON; The greetings from beyond the seas; PERCY M. ASHBURN : A greenhorn's experience in the library; JAMES M. PHALEN : American medical literature, 1836; ALBERT ALLEMANN : Dr. BILLINGS and his work; CLAUDIUS F. MAYER : From drawing to photography in color. An exhibition on the history of the art of medical book illustration from the 12th to the 20th century arranged at the centennial celebration of the army medical library November 16, 1936. G. S.

Arnold, Clement H. Historical gynecology. *Calif. and West. Med.* 44, 40-3, 1936. ISIS

Brief summary.

Baumann, E. D. Historische Betrachtungen über die vis medicatrix naturae. *Janus* 40, 148-70, 197-217, 1936. ISIS

Boerma, N. J. A. F. Iets uit de oudste geschiedenis van de verloskundige tang. *Bijdragen tot de geschiedenis der geneeskunde* 17, 12-20, 4 fig., 1937. ISIS

Early history of the gynaecological forceps. G. S.

Bologa, Valeriu L. Deutsche Einflüsse auf die Entwicklung der rumänischen Medizin. *Südostdeutsche Forschungen* 1, 116-47, München, 1936. ISIS

Bologa, V. L. Die Anfange der rumänischen Schulmedizin. *Medizinische Zeitschrift* 10, 293-96, 1935. ISIS

Brunn, Walter von. Das Institut für Medizingeschichte an der Universität Leipzig. *Mitteilungen zur Geschichte der Medizin der Naturw. u. d. Techn.* 36, 1-4, 1 fig., 1937. ISIS

Hanzlik, Harold. Medical conditions, practices, and foundations in

the Continental colonies. *Calif. and West. med.* 45, 169-71, 275-78, 1936. ISIS

Refers to period between 1620 and 1800 in the American English colonies.

Macri, Ionel P. Quelques principes hippocratiques dans la lumière de la science médicale moderne. 20 p. (Universitatea " Regele FERDINAND I " din Cluj, facultatea de medicina, no. 1011). Cluj, Institutul de arte grafice Ardealul, 1936 (in Rumanian). ISIS

Rolleston, Sir Humphry. Medical eponyms. *Annals of medical history* 9, 1-12, 7 fig., 1937. ISIS

Sticker, Georg. Das Institut für Geschichte der Medizin an der Universität Würzburg. *Mitteilungen zur Gesch. d. Med., d. Naturw. u. d. Techn.* 36, 5, 1937. ISIS

53. — PHARMACY, PHARMACOLOGY, TOXICOLOGY

Augsburg. Aus der Geschichte der Engelapotheke zu Augsburg. Zur Geschichte der deutschen Apotheke, Geschichtliche Beilage der Deutsche Apotheker-Zeitung, Nr. 2, 5-8, illus., 1936-37. ISIS

Darmstaedter, Ernst. Ein Ueberblick über Begründung und Ausbau der Cocain-Lokalanästhesie. *Schmerz, Narkose, Anaesthesie* H. 5, 155-69, 1936. ISIS

Desoille, Henri. L'empoisonnement par les cigües. *La Presse médicale* 63, 1267, 1936. ISIS

On a soutenu, on soutient encore parfois que la description de PLATON est imaginaire et que le poison que prit SOCRATE n'était pas de la grande cigüe. IMBERT-GOURBEYRE, il y a soixante ans en donna cependant une remarquable démonstration que l'auteur reprend. Tous les symptômes propres à cette intoxication brutale et rapide : paralysie ascendante, anesthésie avec sensation de froid, intelligence restant intacte, mort en trois heures par syncope, ont été exactement décrits par PLATON. Aujourd'hui cette intoxication peut être vaincue. Le poison s'élimine en effet rapidement par l'urine. D'autre part, la mort ne survenant que par paralysie respiratoire, on peut l'éviter grâce à la respiration artificielle, opération qui permet d'attendre que le toxique soit éliminé. L. L.

Muls, G. L'abbaye D'ORVAL et sa pharmacie. *Annales de E. Merck*, 1ere partie, 1935. ISIS

La pharmacie de cette célèbre abbaye cistercienne belge fut en grande partie détruite pendant la Révolution française. Ce qui contribua surtout à sa réputation, ce furent trois grandes spécialités : l'eau d'arquebusade, l'eau impériale, l'eau d'ORVAL toutes trois des panacées. Peu d'objets ont pu y être retrouvés mais certains tels une balance du XVIII^e siècle et un grand mortier en bronze du XVII^e siècle signé PETER DE GHEIN présentent un grand intérêt. Photographies. L. L.

VIII. — EDUCATION

(the methods of accumulating, imparting and diffusing knowledge)

56. — BIBLIOGRAPHY (*Methods, libraries*)

Bibljoteka jagiellonska. Katalog wystawy druków krakowskich XV-Go i XVI-go wieku. 58 p., 10 pl. Kraków, Skład Głowny w Księgarni Gebethnera i Wolffa, 1936. ISIS

Catalogue of the books printed in Cracow in the fifteenth and sixteenth centuries by 22 printers the first of whom was KASPER STRAUBE, 1474(?)-1477(?). G. S.

58. — CATALOGUES OF SECOND-HAND BOOKS ON THE HISTORY AND PHILOSOPHY OF SCIENCE

Many catalogues of second-hand books are so interesting and so full of valuable information that we shall henceforth register them in this section, together with other lists of a similar nature, such as catalogues of scientific medals and prints. When applying to the publishers of these catalogues for a copy, please mention *Isis*.

Fock, Gustav. Archaeologie numismatik der Griechen und Römer. Nebst Anhang klassisch-philologische Dissertationen und Abhandlungen sowie Zeitschriften und Sammelwerke. Antiquariats-Katalog Nr. 710, 154 p., 4757 items, Leipzig C 1, Sternwartenstr. 8, (received Feb. 1937). ISIS

Goldschmidt, E. P. Navigation, geography, travels, shipbuilding, trade & commerce, economics, with a collection of French royal administrative acts relating to the navy, the post and road transport in France. Cat. 42, 97 p., 392 items. London, W. 1, 45 Old Bond St. (received Feb. 1937). ISIS

Goldschmidt, E. P. Old science and medicine, catalogue 43. 64 p., 215 items, figs. London, W. 1, 45 Old Bond St. (received Feb. 1937). ISIS

Hoosier Bookshop. Medicine, Americana medica, fundamental texts illustrating the history of medicine. Miscellaneous. List 48. 143 items. Indianapolis, Indiana, 2242 Park Ave (received Feb. 1937). ISIS

International Antiquariaat. Medical books XVth-XXth century, pharmacology-botany, astronomy-physics, occultism. Catalogue no. 80. 58 p., 635 items. Amsterdam, Keizersgracht 610 (received Feb. 1937). ISIS

Junk, W. Reptilia amphibia. No. 90. 30 p. The Hague, Scheveningsche Weg 74, 1937. ISIS

Stevens, Henry, Son & Stiles. A catalogue of atlases maps and books relating to the sea. New series no. 24. 152 p., 1006 items. London, W. C. 1 39 Great Russell St. (received Feb. 1937). ISIS

Verlag Chemie. Chemie; Physik. 15. Verzeichnis antiquarischer Bücher und Zeitschriften nebst Novitätenliste. XV. Catalogue. 32 p., Berlin, W35, Corneliusstrasse 3, 1936. ISIS

59. — MEMORIA TECHNICA

Critical Bibliography no. 50. *Isis.* Vol. 27, 364-410, 1937. ISIS

This note is published at the end of our bibliography solely for the convenience of the scholars who cut out the whole or part of it, attach extracts to catalogue cards and classify them. By adding this note to the others they will be able to find out rapidly whether this particular bibliography has been analyzed or not.

Isis no. 66 (vol. 23, 2, 320 p., 4 pl., 6 facs.). Bruges, 1935. ISIS

This number is analyzed in the 45th Critical Bibliography.

Isis no. 71 (vol. 26, 1, 298 p., 14 fig.) Bruges, 1936. ISIS

This number is analyzed in the 50th Critical Bibliography. Every previous number has been analyzed in previous bibliographies. G. S.

60. — ERRATA

Si quis Argi oculos habere posset eosque omnes diligentissime ac accuratissime intenderet in singulos versus, multa tamen eum inter corrigendum effugerent.

Isis

Vol. 23, 567. Second COOMARASWAMY note. Read 487-97, instead of 87-97. ISIS

Vol. 26, 53. Suppress footnote. ISIS

A few other misprints are not mentioned in these errata because they are too obvious to cause any error or confusion. I wish to express my thankfulness to the readers who take the trouble to make the above-mentioned corrections in their set of Isis and the Introduction. I would advise them, after having accomplished that little task, to write their initials near mine at the bottom of this note to indicate that these and previous errata have been taken into account. G. S.

These and the previous errata have been corrected by.....

Index of Authors Included in the Fiftieth Bibliography

The Roman figures followed by (1) or (2) refer to the centurial classification (Part I). Thus, Alberti, L. B., XV(1) means that a paper by Alberti, L. B. is listed under fifteenth century, first half.

The Arabic figures refer to the historical and to the systematic classifications (Parts II and III) which are subdivided into sections numbered consecutively from 1 to 60. For instance, Cornwall, E.E., 4, indicates that a paper by Cornwall is listed in section 4 (Greece), and Bell, E. T., 20, indicates that a paper by Bell is listed in section 20 (Mathematics).

March 9, 1937. FRANCES SIEGEL.

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Isis Report for 1936

Jan. 28, 1937.

Dear Sir,

The enclosed report is submitted as a matter of routine to the members of the Council of the HSS, to the members of the editorial board of *Isis* and to a few friends. (For previous report, see *Isis* 25, 620).

For the first time in the history of *Isis* (25 years), the account shows a profit. This seemed so incredible that I rechecked my reckoning in various manners but I had finally to bow to the facts. That unexpected success is partly accidental being due to the devaluation of the Belgian franc.

The *Osiris* account is naturally less favorable. Vols. 1 and 2 were published at a total loss of $ 564.18. The loss would have been three times heavier but for the receipt of a thousand dollars from an old friend.

The total loss for the 4 vols. (2 of *Isis* and 2 of *Osiris*) was only $ 388.26, or less than a hundred dollars per volume.

The beneficient effect of *Osiris* upon *Isis* was already noticeable in 1936. Thanks to the removal of the longer articles, the contents of *Isis* were far more varied; the main articles were twice more numerous in 1936 than in 1935 (49 *vs.* 25).

Yours sincerely,

GEORGE SARTON.

This report covers nos. 68 to 71, that is, a total of 1225 pages, with 7 pl., 59 fig., including 49 memoirs, 42 shorter items, 91 reviews and 2060 bibliographic notes. For comparison, see Report of 1935 in *Isis* 25, 620.

Summary of accounts

Expenditures			*Receipts*	
1. Printing	2,217.02		HSS.	1,780.00
2. Plates, figs. . . .	88.84	2,305.86	CI	1,263.75
Mailing		522.92	Sales Bruges . .	584.37
Royalties			Sales Brussels .	171.56
Reprints	197.83		Sales varia . . .	48.00
Gifts	109.20	307.03	Friends	25.00
Editorial				3,872.68
Camb. office. . .	184.66		N.B.—Less than half the income of *Isis* (46 %) is obtained from HSS.	
Brussels office. .	257.66	442.32		
Advertizing . . .		102.63		
Insurance of stock		16.00		
		3,696.76		
Editor's gain . .		175.92		
		3,872.68		

The cost of printing (items 1 and 2) averaged $ 1.88, the total cost, $ 3.02 per page.

N. B.—This account is not entirely exact as I have not taken into account the continual fluctuations of the exchange. For the sake of simplification Belgian francs have been converted into dollars at the single rate of 34 to 1.